

DECEMBER 1951  
 VOL. 10, NO. 12

# ELECTRICAL CONSTRUCTION AND MAINTENANCE

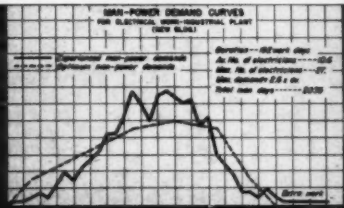
WITH ELECTRICAL CONTRACTING



RECENT ADVANCEMENTS in electrical contracting lighting equipment and techniques are discussed in the 200-page book.

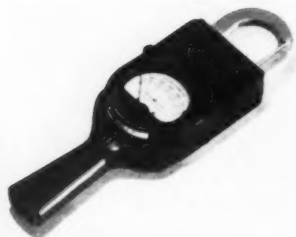


WATSON TABLE is typical of complex electrical layout for modern manufacturing and assembly.



WATSON TABLE is typical of complex electrical layout for modern manufacturing and assembly.

# QUICKLY AVAILABLE!



## AK-1 VOLT-AMMETER

Ranges 0-15 60 150/600 volts  
0-150 600 amperes

Accuracy  $\pm 3\%$  full scale

PRICE \$74.75

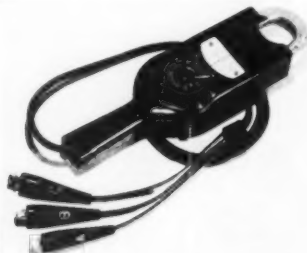


## AK-2 WATTMETER

Ranges 0-3, -6, -20, -60, -200, -300 kw  
15-600 amperes, 100-600 volts

Accuracy  $\pm 3\%$  full scale

PRICE \$84.75



## AK-3 POWER-FACTOR METER

Ranges 100-600 volts, 15-600 amperes

Scales A: 0.5-0.05 lag-lead  
B: 1.0-0.5 lag  
C: 0.5-1.0 lag

Accuracy 0-0.05 power factor

PRICE \$84.75

## Cleveland Company Saves More Than \$500; Cuts Testing Time 50% with G-E Hook-ons



### Three Hook-on Instruments Provide Complete Power-testing Equipment

The Motor Repair and Manufacturing Co. of Cleveland, Ohio, finds the General Electric team of three hook-on instruments to be the answer to their electrical maintenance problems. Mr. Carol Levinson, President of Motor Repair and Manufacturing Co., reports, "I previously spent over \$500 for testing equipment which I have now discarded since the purchase of these three instruments."

### REPLACES SIX INSTRUMENTS

"My hook-on power-factor meter alone does the job previously done by using a wattmeter, two current transformers, two ammeters, and a voltmeter," says Mr. Levinson. "Time that was formerly lost in computing the results of readings is now being put to better use." Construction of these hook-on instruments permits easy handling and quick analysis of any electrical problem.

Designed to fill almost all of the needs in electrical maintenance checks, General Electric hook-on instruments measure volts, amperes, reactive current, power, and power factor.

Used for motor checks and unbalanced loading checks of polyphase circuits, the AK-1 volt-ammeter is lightweight and accurate—3% full scale.

The AK-2 wattmeter is a handy portable instrument for measuring a-c power

if your power factor is now	you can re- lease this much extra capacity	with this many capacitors for each 100 kw of load
65%	34%	84 kvar
70%	29%	69 kvar
75%	23%	55 kvar
80%	17%	42 kvar
85%	11%	29 kvar
90%	5%	15 kvar

(Power factor is raised to 95%. New load is at original power factor.)

quickly and easily. Both single and poly-phase circuits can be analyzed by the AK-2; in addition to kilowatts, it will measure vars in balanced three-phase circuits.

Accurate to within 0-0.05 PF, the AK-3 power-factor meter may be used on any balanced 3-phase circuit. It reads power factor directly in the circuit. When making capacitor surveys, you'll find the AK-3 a valuable time saver. The table above shows what you can expect from adding capacitors to your feeder lines.

**BUY NOW FROM  
STOCK  
At Your Nearest  
G-E Distributor**

GENERAL  ELECTRIC

6/2-2,1



# 55 AMPERE CIRCUIT BREAKER SERVICE CONTROL ...ALWAYS CARRIES FULL LOAD

## Another NEW Murray Product

that gives you  
*Fully Magnetic*  
circuit protection

Fully Magnetic Circuit Breakers always carry their full rated load—never need derating. The magnetic principle of operation is not affected by changes in temperature.

Murray Breakers give three way circuit protection.

1. Timed delay to carry harmless overloads.
2. Timed tripping on dangerous overloads.
3. Immediate tripping on short circuits.

### WHAT IS IT?

Service Control equipment with 55 ampere main capacity and two—50 ampere single pole Fully Magnetic Circuit Breakers. Supplied with handle extension for simultaneous manual tripping. Available in surface or flush. Listed by Underwriters' Laboratories, Inc.

### HOW IS IT USED?

1. In place of a comparable 60 ampere fused switch.
2. As service entrance equipment.
3. As a main disconnect.
4. For protecting single phase lighting and appliance circuits or for fractional horse power motor circuits.
5. For protecting electric range circuits.
6. For use on 2 wire, 250 volt service without neutral or; 3 wire 125-250 volt wiring with neutral or 2 wire 125 volt with neutral.

### IS IT AVAILABLE?

YES—immediate shipment—see your electrical distributor or write the factory—specify catalog number LC002H.

50 YEARS OF SERVICE TO THE ELECTRICAL INDUSTRY

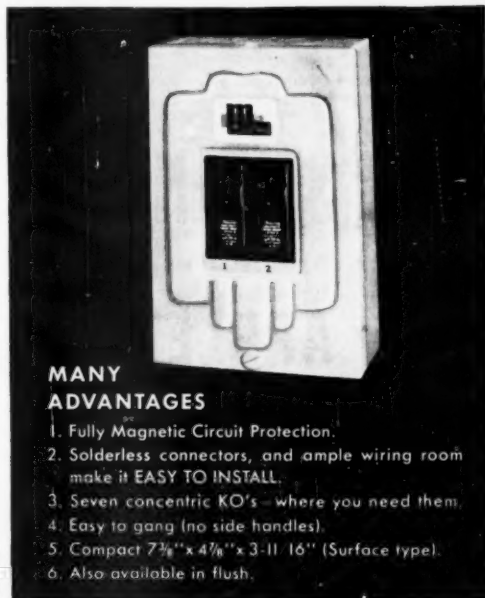


For detailed information, write:

**MURRAY MANUFACTURING CORPORATION**  
1250 ATLANTIC AVENUE • BROOKLYN 16, N.Y.

Service Entrance & Meter Equipment • Magnetic Circuit Breakers • Switches • Current Limiting Reactors • Crows' Nest Aerial Ladders

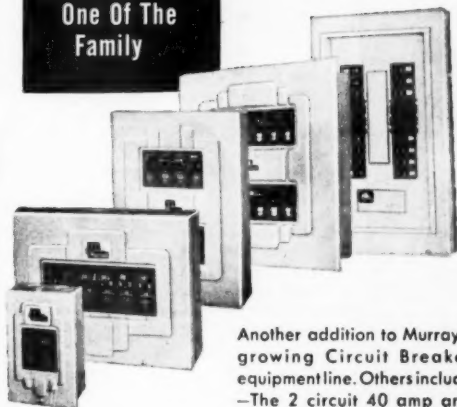
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### MANY ADVANTAGES

1. Fully Magnetic Circuit Protection.
2. Solderless connectors, and ample wiring room make it EASY TO INSTALL.
3. Seven concentric KO's—where you need them.
4. Easy to gang (no side handles).
5. Compact 7 $\frac{1}{2}$ " x 4 $\frac{1}{8}$ " x 3-11 16" (Surface type).
6. Also available in flush.

### One Of The Family



Another addition to Murray's growing Circuit Breaker equipment line. Others include

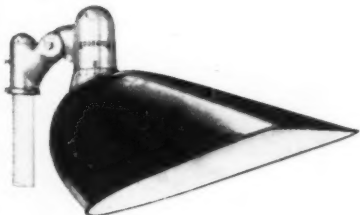
—The 2 circuit 40 amp and 100 amp, the "6", the "8", the "12" and the "20" Circuit Protectors. Panel boards up to 42 branch circuits.

# SENTINELS OF SAFETY



**ELIPSO STANDLITE—**  
Expertly designed to provide protection for industrial properties.

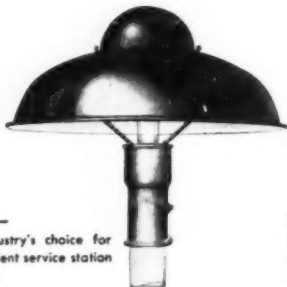
## APPLETON LIGHTING EQUIPMENT



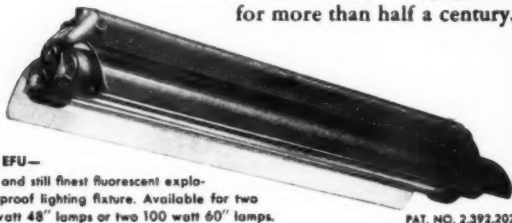
**DIFFUS FLOODLIGHT—**  
For even illumination of service stations, athletic fields, parking lots, etc. Pole, Bracket or Crossarm mounting.



In these days of accelerated production, good light for outdoor working areas and grounds is a vital *must* for both personnel safety and plant protection. Outdoor lighting planned with Appleton Equipment is your assurance of top-notch illuminating efficiency at minimum installation, service and operating expense. Appleton Lighting Fixtures are available in the exact type and size for every industrial requirement—including hazardous locations—whether indoors or out. For the finest in illuminating fixtures specify Appleton—pace-setting manufacturer of electrical equipment for more than half a century.



**STANDLITE—**  
The oil industry's choice for sturdy, efficient service station illumination.



**THE EPU—**  
First and still finest fluorescent explosion-proof lighting fixture. Available for two 40 watt 48" lamps or two 100 watt 60" lamps.

PAT. NO. 2,392,202



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OUTLET BOXES AND SWITCH BOXES

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**PRODUCTS**

EXPLOSION-PROOF FITTINGS • REELITES

# ELECTRICAL CONSTRUCTION AND MAINTENANCE

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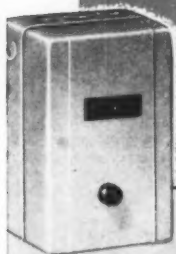
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## MOTOR STARTERS

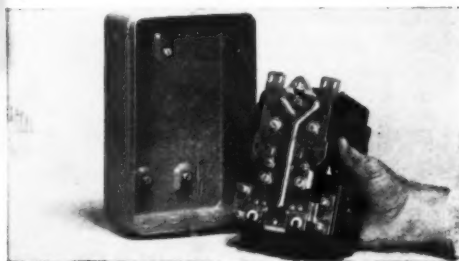
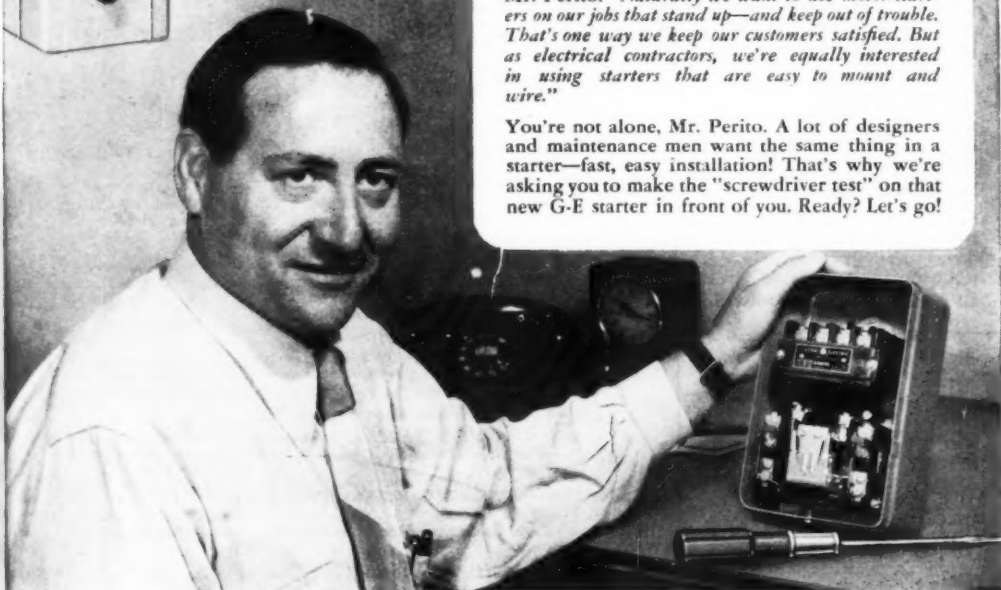


# ...easier to

T. G. PERITO, OF LONG ISLAND CITY, LEARNS

Mr. Perito: "Naturally we want to use motor starters on our jobs that stand up—and keep out of trouble. That's one way we keep our customers satisfied. But as electrical contractors, we're equally interested in using starters that are easy to mount and wire."

You're not alone, Mr. Perito. A lot of designers and maintenance men want the same thing in a starter—fast, easy installation! That's why we're asking you to make the "screwdriver test" on that new G-E starter in front of you. Ready? Let's go!



**1** Mr. Perito: "How is this contactor mounted in the case?"  
By means of keyhole slots you see in the contactor base, Mr. Perito. After you've mounted the empty case on the wall or a machine, you locate the keyhole slots over the mounting screws and the contactor slips into place!



**2** Mr. Perito: "Lots of knockouts, I see!"  
You'll find these on every side of the case—more than enough to give you faster, neater installations. Plenty of room on the inside, too, and notice how the light grey finish on the inside gives you plenty of reflected light!

# GENERAL ELECTRIC

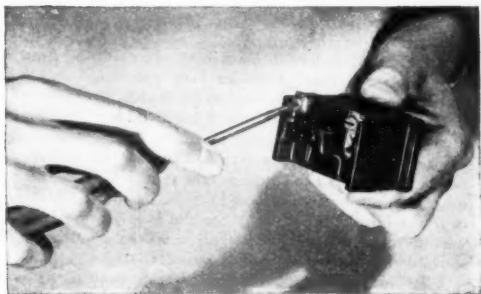
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# install for these 6 reasons

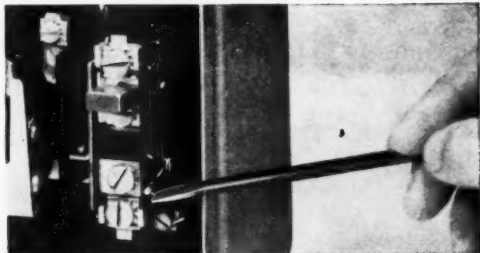
ABOUT THESE IMPORTANT FEATURES WITH THE "SCREWDRIVER TEST"



**3** Mr. Perito: "Are all the terminals easy to get at?" Every one of them is *up front* where it's easy to get at, and wire. And they're *big* terminals with panhead screws and saddle-type connectors that ride up with the screw head. The stripped wire simply slides into place and is easily secured with a turn of your screwdriver.



**4** Mr. Perito: "Tough-looking coil! Is it new?" Right! It's called the "Strongbox Magnet Coil" and it's an exclusive with the new G-E starter line. Feel how solid it is! If your electrician's screwdriver slips, it can't hurt the windings—they're safely locked in a block of molded plastic. And oil, dust or water can't get at them, either!



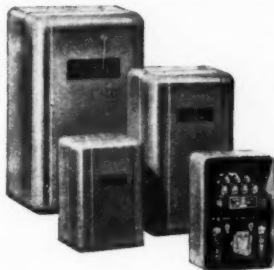
**5** Mr. Perito: "How do I set the overloads?" Easy—and you don't have to take the starter apart to do it. Flip that little lever and it's on "Automatic." Flip it back and it's on "Manual." Heaters are in the front, can be changed without disturbing any wiring.



**6** Mr. Perito: "What about maintenance?" Once this new G-E starter is installed, it *stays* installed. There's no need to remove the case for ordinary maintenance or even to replace or reverse contacts. Just remove the arc chute and there are your terminals.

## WHY DON'T YOU

### "BUY ONE AND COMPARE?"



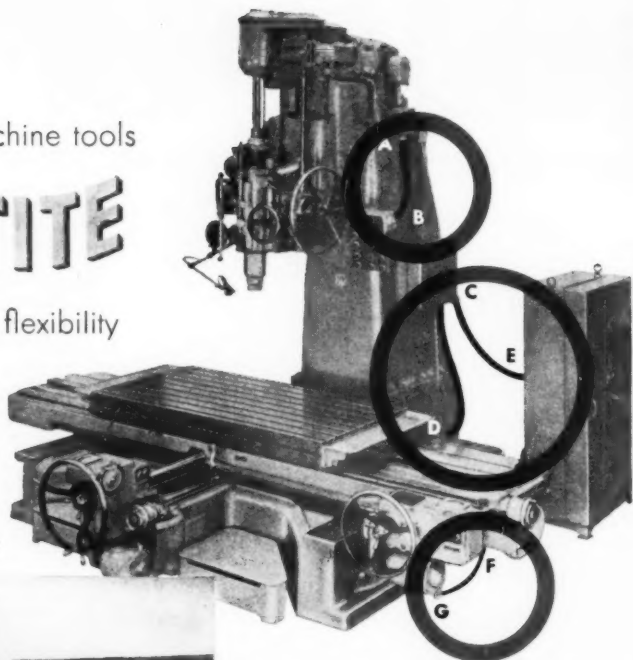
See for yourself why this new line of G-E motor starters lasts longer, costs less to install than almost any other starter you can buy. Your G-E representative or authorized G-E agent or distributor can supply you from stock in NEMA sizes 0, 1, 2 and 3 for a-c motors up to 50 hp. For a complete description, write for Bulletin GEA-5153, Section 730-18, Apparatus Dept., General Electric Company, Schenectady 5, New York.



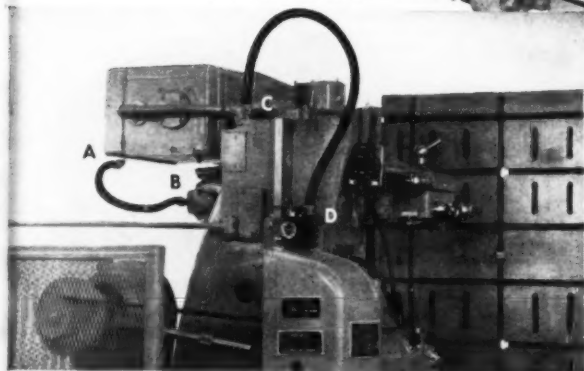
**P&W** designs its machine tools

with **SEALTITE**

for **liquid-tight** flexibility



PHOTOS FROM PRATT & WHITNEY—  
DIV. OF NILES BEMENT-POND CO.



This Pratt & Whitney No. 4E vertical-type Jig Borer is the world's largest. Power and control wiring to movable units is fully protected and flexible in Sealtite Flexible Conduit.

(A) Machine Column to (B) Remote Control Station. (C) Main Terminal Board to (D) Machine Carriage and (E) Control Cabinet. (F) Carriage to (G) Motor.

Through a sensitive, electrically-controlled tracer, this Pratt & Whitney-Keller Type BL Milling Machine automatically and faithfully reproduces the shape of a master form. Movable control and power wiring is enclosed in Sealtite Flexible Conduit.

(A) Vertical Drive Gear Box to (B) Motor. (C) Machine Column to (D) Tracer Bracket.

**I**N these high-precision machine tools, made by Pratt & Whitney, Sealtite\* provides both protection and flexibility for wiring to parts that are movable.

Useful as Sealtite is on many kinds of machine equipment, it's equally versatile in many other jobs — for dampening vibration, for cramped connections and short-radius bends. Sealtite's liquid-tight synthetic jacket resists oil, gases, most chemicals and steam. Its tough steel core can take impact. That's why Sealtite is at work wherever wiring must be protected against severe conditions in movable, stationary or temporary installations.

Your electrical supply house carries Sealtite. If you would like more information, write to The American Brass Co., American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co. Ltd.

51222

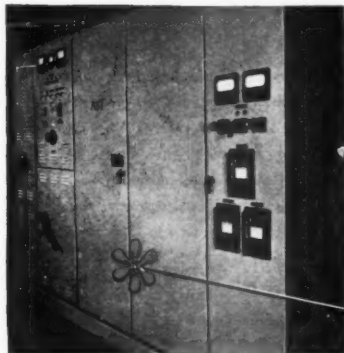
\*Trademark

for **flexible, liquid-tight** electrical conduit... specify

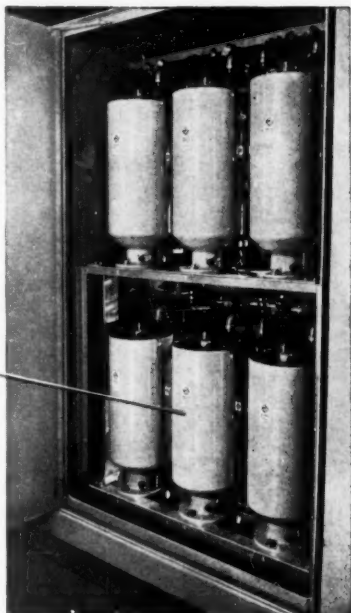
**SEALTITE** AN ANACONDA® PRODUCT

# Don't build around obsolete DC supply

## *-RETIRE IT NOW!*



Modern Allis-Chalmers factory packaged, sealed tube, 500 kw mercury arc rectifier as installed in midwestern industrial plant. Left: "dead-front" compartments for dc feeders, dc metering and cathode breaker, rectifier tubes, and ac control and metering. Right: interior view of mercury arc rectifier tube compartment.



**N**OW IS THE TIME to retire obsolete converting and generating equipment. As operations expand, this inadequate equipment will become a growing handicap.

Now too — while there is a favorable base for amortization — is the time to consider mercury arc rectifiers for your expansion plans. Let Allis-Chalmers show you how the *modern* mercury arc rectifier can improve your direct current service.

**LOW MANPOWER REQUIREMENT.** With push-button starting and no synchronizing required, attendants are not needed during normal operation. Downtime for maintenance is reduced with no moving parts to lubricate or wear.

**LOW COST OPERATION.** Conversion efficiency is higher at all loads with large power savings during light load periods.

**CONVENIENT INSTALLATION.** Factory packaged, light in weight, and requiring no special foundation, Allis-Chalmers mercury arc rectifiers may be placed right at the load center.

**IMPROVED PLANT OPERATION.** With dc load center installation, distribution distances are cut, dc feeder losses are reduced, and full voltage is available at production equipment.

Whatever your specific direct current needs, Allis-Chalmers builds suitable and truly modern mercury arc rectifiers to meet them.

Sealed tube rectifiers (as shown above) are supplied in ratings from 200 to 1000 kw for lighter duty service. These are commonly used in large buildings, industrial plants and electric haulage systems. Pump evacuated rectifiers are built from 750 kw to the largest ratings required for heavy duty applications.

An Allis-Chalmers representative will be glad to explain in detail how these modern mercury arc rectifiers will improve the operation of *your* direct current system. Call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3467

# ALLIS-CHALMERS



## MERCURY ARC RECTIFIERS

# About your Business



## A "QUOTE" ABOUT ACCOUNTING

From the Report of the Research and Education Committee, National Electrical Contractors Association.

"By means of proper accounting the life blood of a business—its liquid assets—is kept from being dissipated. Accounting calls attention to the loss of this life blood. When jobs are losing money, the fact is made known in sufficient time to enable management to prevent greater losses. Accounting affords an opportunity also to increase profits when they are less than the job should properly yield. It is the all-important finger-on-the-pulse which notifies of impending disaster in time to take proper action."

## How Day-Brite can help keep the "LIFE BLOOD" in your business!

Your accountant will like what he sees . . . if you and your men concentrate on selling Day-Brite Fixtures!

First of all, Day-Brite enables you to put the most profitable kind of business on your books . . . the kind where you go out and sell your fixture without profit-squeezing bids. Your men can sell Day-Brite because Day-Brite quality, Day-Brite features give them *something to sell*. They can prove it's decidedly better lighting!

Second, Day-Brite keeps your business from "bleeding" at a point accountants have learned to watch carefully . . . the column labeled "installation costs." Day-Brite fixtures are designed for easiest possible installation . . . *do* save time on the job. Actually, you can count on a "hidden bonus" here.

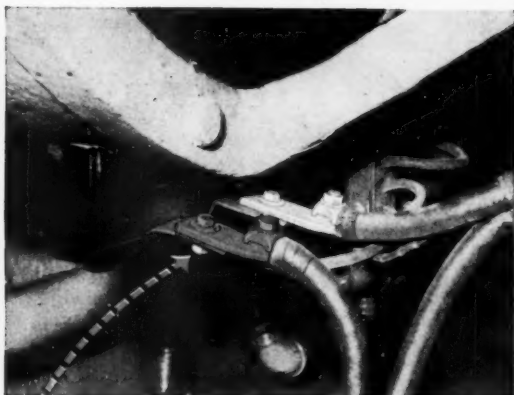
Third, Day-Brite quality reduces costs in still another column on your ledger . . . on "call backs," extra service costs which you must pay for out of your profits. We've found it pays to sell quality. Day-Brite today sells more lighting fixtures than any single company. We believe that it will pay you, too . . . that your accountant will be a lot happier if you sell—*really* sell—Day-Brite! Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis, Mo.

NOW,  
MORE THAN EVER  
**AMERICA**  
MUST SEE  
WHAT IT'S  
DOING!

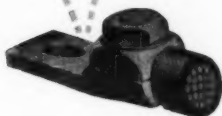
IT'S EASY TO SEE WHEN IT'S



125



to get



# re-use... use QIKLUG



To cut costs, conserve materials, and make your supplies go further, it's wise today to use Burndy Qiklug connectors. Built for durability, Burndy Qiklugs are constructed of high-conductivity, corrosion-resistant alloys, with clean, husky threads... so they can be used over and over again! Added to Qiklug's ease of installation (with an ordinary wrench) and compact design, this timely, extra-life advantage makes it more important than ever to use... and *re-use*... Qiklug!



Servit



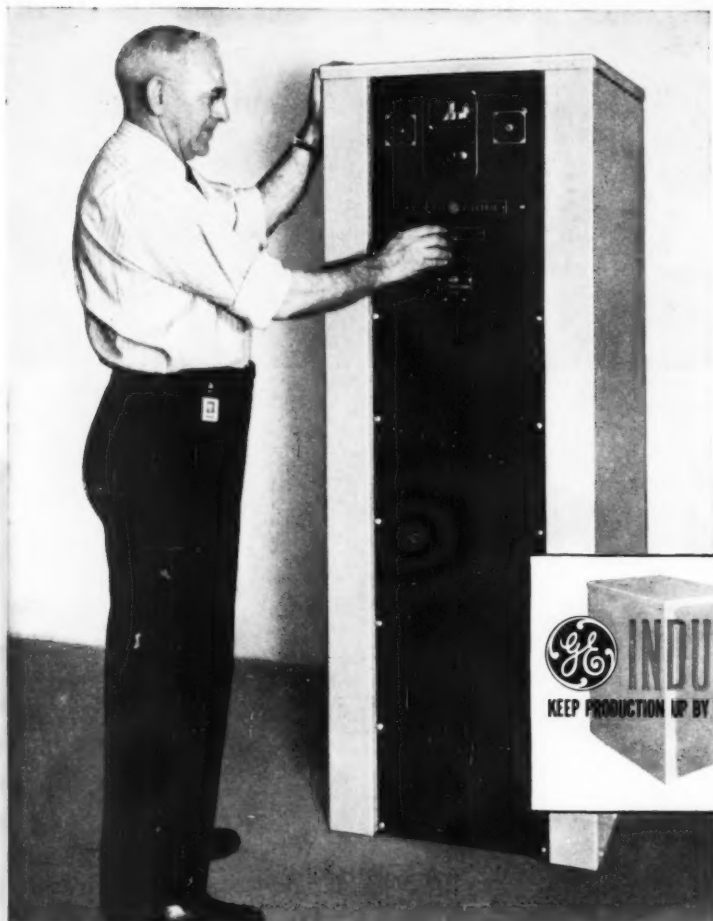
Scrulug



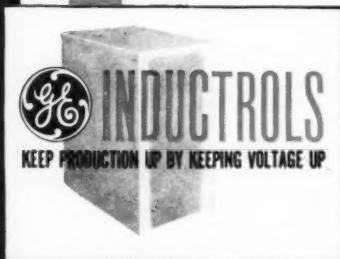
Versitap

## BURNDY CONNECTORS

BURNDY, New York 54 • Western Branch: Vernon 58, Cal. • Burndy Canada Ltd., Toronto 8, Ontario



This new three-phase Inductrol gives you more kva of regulation in a smaller floor space than ever before.



## General Electric's NEW INDUCTROLS

(dry-type induction voltage regulators)

**will help you get out more production**

Poor voltage can mean sluggish performance of electrical equipment—and reduced output. To be sure you are getting the motor performance and lamp brilliance you pay for, keep voltage up with General Electric's Inductrols.

New, improved Inductrols have been introduced this year for both single-phase and three-phase circuits, 600 volts and below. These new dry-type regulators automatically maintain correct voltage on your equipment. They do not require expensive fireproof

vaults. The attractively styled all-steel cabinets completely enclose all live parts for greater safety. Standard automatic regulators are available for circuits ranging from 3 kva, 120 volts up to 500 kva, 600 volts.

For advice on how, when, and where to apply Inductrols, get in touch with your G-E sales representative or authorized agent.

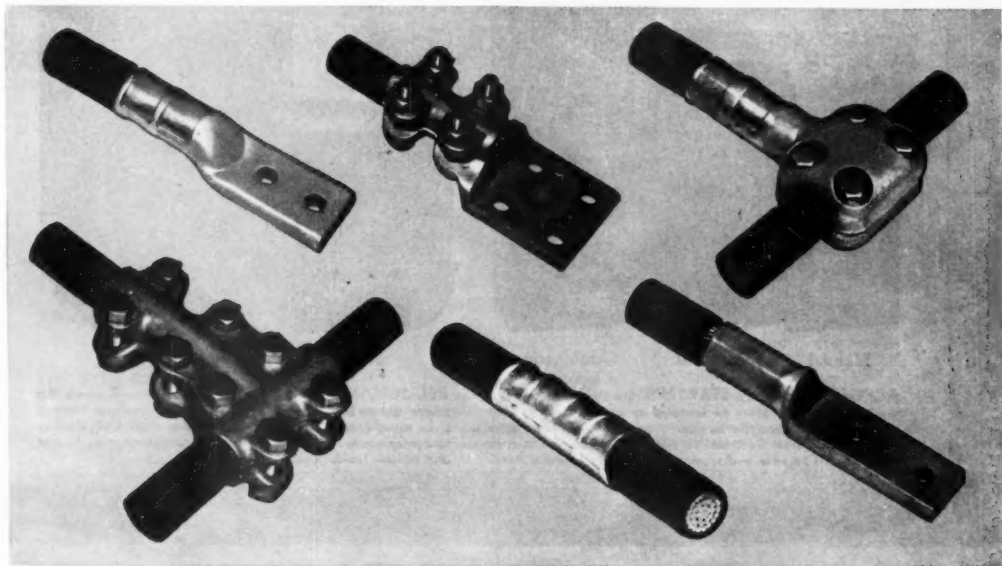
Write for Bulletins GEC-712 and GEC-795. General Electric Company, Schenectady 5, New York.

404-81

**GENERAL**  **ELECTRIC**



# connecting Aluminum Conductor?



Leading manufacturers of cable fittings are now supplying well designed fittings specifically for making connections of the various types in the popular sizes of insulated aluminum wire and cable.

Illustrated above are typical fittings offered by several of the leading fittings manufacturers. Further details are available from the Alcoa sales office nearest you, or, ALUMINUM COMPANY OF AMERICA, 1775M Gulf Building, Pittsburgh 19, Pennsylvania.



## Aluminum Conductors



of **ALCOA**  **ALUMINUM** are made by leading manufacturers

## 110-550 Volt MOTOR STARTERS



Manual

Magnetic

Combination

**ACROSS-THE-LINE STARTERS** are easy to install and wire—compact enough to be installed on or near the controlled machine. Manual Starters in sizes 0 and 1, Magnetic in sizes 0-7 for motors from fractional to 600 hp, Combination in sizes 0-5. General Purpose and special enclosures to fit every need.



Manual

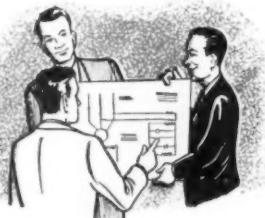
Magnetic

**REDUCED-VOLTAGE STARTERS** are used where the power system has insufficient capacity for full-voltage starting . . . to safeguard machinery or processes from high starting torque or current inrush. Choose from autotransformer, reactor and resistor types. Wide line available.

# STARTERS for

Choose From This Wide Selection of Generously Designed Starters  
... Backed by Broad Application Experience in Every Industry

**W**HATEVER YOUR CONTROL NEED — starting, smooth acceleration, speed control, stopping, reversing, dynamic braking — there is an Allis-Chalmers starter to do the job. All are easy to install and have construction features that as-



sure long life, dependable operation, simplified inspection.

**Low-Voltage Starters, Sizes 0-3** for example, have silver-to-silver double break contacts that never require dressing. A screwdriver is the only tool you need for inspection of magnet coils, heaters, contacts — all replaceable parts.

**Sizes 4-7** have time-proven clapper-type contacts with rolling-wiping action to keep current carrying areas clean, free of pitting and arcing. Current is interrupted quickly and arcing minimized by chutes of new design. All electrical and mechanical parts are easily accessible.

**High-Voltage Starters** give you

everything needed for complete motor control and protection in a single enclosure. Contactors, meters, overload relays, auxiliary switches — all needed parts are selected to meet the requirements of your application. Enclosures are compartmented to isolate high-voltage devices. If you need the short circuit protection of current limiting fuses, specify Type H high-voltage starters.

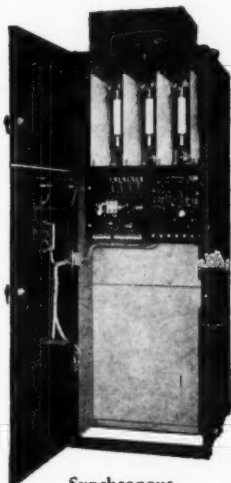
Remember, A-C application engineers have wide experience serving all industry. Their experience, plus this broad line of starters, is your assurance of the right starter for your job. Call your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

**2300-5000 Volt  
MOTOR  
STARTERS**



**Squirrel-Cage**

**THE TYPE 371** Wall-Mounted Starter for 2300-volt motors is completely sealed . . . protects the completely oil-immersed mechanism from weather, corrosion and dust. Wall mounting saves space.



**Synchronous**

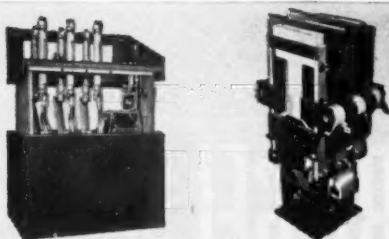
**ALLIS-CHALMERS** Synchronous Motor Starters apply field excitation automatically when proper speed is reached . . . even select the exact half cycle for smoothest field application.



**Wound-Rotor**

**WOUND-ROTOR** Motor Control for either starting or speed control duty, is built with the number of accelerating points your application requires. High-Voltage Starters are built for motors to 2500 hp.

# Every Motor Need!



**OIL-IMMERSED or AIR-BREAK** — The contactor best suited to your application is standard in Allis-Chalmers high-voltage starters. Both are designed for ready access — built to give long life, low maintenance. Air-break contactors available with interrupting capacity to 50,000 kva.

Allis-Chalmers, Milwaukee 1, Wisconsin

## Send for These

Send me the bulletins indicated below:

- ☐ High-Voltage Starters . . . . . 1486410
- ☐ Type 371 Wall-Mounted Starter . . . . . 1487274
- ☐ Type 256 Air Contactor . . . . . 1487303
- ☐ Low-Voltage Across-the-Line Starters . . . . . 1487132
- ☐ Low-Voltage Reduced-Voltage Starter . . . . . 1487215
- ☐ Control Devices . . . . . 2587095

Name \_\_\_\_\_  
 Title \_\_\_\_\_ Company \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ A-3529

# ALLIS-CHALMERS



# THE TWO E·M·T FITTINGS

THAT ARE EASIER TO USE—  
SAVE MONEY TOO!



Easier to use and neater in appearance, Briegel All-Steel Indenter Fittings not only make stronger connections but also make each job more profitable. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job a better job. It is only natural that Briegel Fittings are the most widely used E.M.T. connectors and couplings.



## BRIEGEL METHOD TOOL CO.

GALVA, • ILLINOIS

*Distributed by*

The M. B. Austin Co., Northbrook, Ill.; Clayton Mark & Co., Evanston, Ill.; Clifton Conduit Co., Jersey City, N. J.; General Electric Co., Bridgeport Conn.; The Steelduct Co., Youngstown, Ohio; Enameled Metals, Pittsburgh, Penn.; Wagner Malleable Products Co., Decatur, Ill.; Kondu Mfg. Co., Ltd., Preston, Ont.

# SAME KVA, BUT 45% LIGHTER!

**3-KVA**

<b>Old Type M</b> 103 pounds	<b>New Type M</b> 57 pounds
---------------------------------	--------------------------------

**New Type D  
(25-100-KVA)  
Average  
28% Lighter**

## NEW G-E DRY-TYPE TRANSFORMERS

Best transformer news in years! Class B insulation and Corasil steel core in new G-E Types M and D transformers have cut weight of 3-kva rating 45% (as much as 49% in other ratings). Size is way down . . . 56% in the 3-kva alone! And all this at *no extra cost to you*. Shipping costs, mounting space, installation time . . . all saved by specifying "G.E." See your nearby authorized distributor or contact your local G-E office today. For complete information on the new Types M and D transformers, write General Electric Company, Schenectady, N. Y.

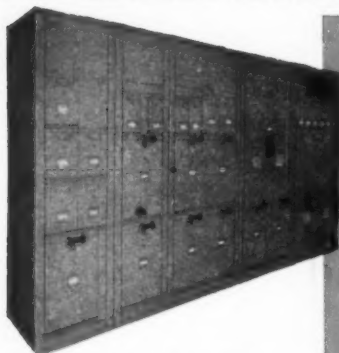


**GENERAL  
ELECTRIC**

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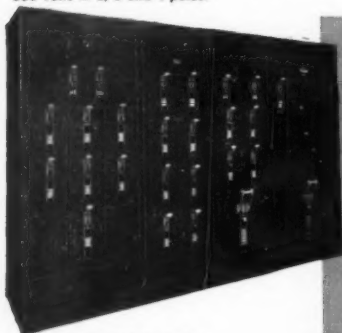
# Standardized for **ECONOMY...**



## **FA KLAMPSWITCHFUZ TYPE**

A safety-type switchboard incorporating the latest features and design . . . an extremely compact unit with almost unlimited electrical capacity . . . greater operating efficiency with less maintenance—safer operations with dead front safety type enclosures and safer, more efficient switching with **FA** Klampswitchfuz or Snufarc (hinged, pull-out type) switches. Excellent for disconnect service on lighting and power circuits.

Capacities: KLAMPSWITCHFUZ 30 to 600 amps. 250 volts AC or DC and **FA** SNUFARC: 30 to 200 amps. 600 volts in 2, 3 and 4 poles.



## **FA SHUTLBRAK TYPE**

A type similar to the Klampswitchfuz, designed for frequent operation of switches. Totally enclosed, this switchboard features the **FA** Shutlbrak switch . . . a front-operated, horsepower-rated industrial switch with quick make and break operations and interlocking fuse doors that permit access to fuse compartment only when switch is "Off."

Capacities: 30 to 1200 amps. 250 volts, AC or DC and 600 volts AC in 2, 3 and 4 poles.

## Tailored for **EFFICIENCY!**

### STANDARDIZED



### SWITCHBOARDS

When it comes to dependable, economical and efficient light and power distribution, Standardized **FA** Switchboards are your answer.

The flexible plan introduced by **FA** of assembling complete sections and units into standardized enclosures, not only provides all the advantages of a "Tailor-Made" switchboard, but affords substantial savings in cost.

Standardized **FA** Switchboards are factory assembled and shipped ready for connection of main and branch circuit cables. Units can be arranged singly or grouped, because all sections readily fit together. Removable end walls permit the addition of sections to either side. The number and capacity of switches are supplied according to your specifications.

Want to know more about these safe, efficient, long-lasting, trouble-free Switchboards? Just see your nearest **FA** representative, listed in Sweet's, or write to . . .



## *Frank Adam Electric Co.*

ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE  
EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

*Our 60th Year*

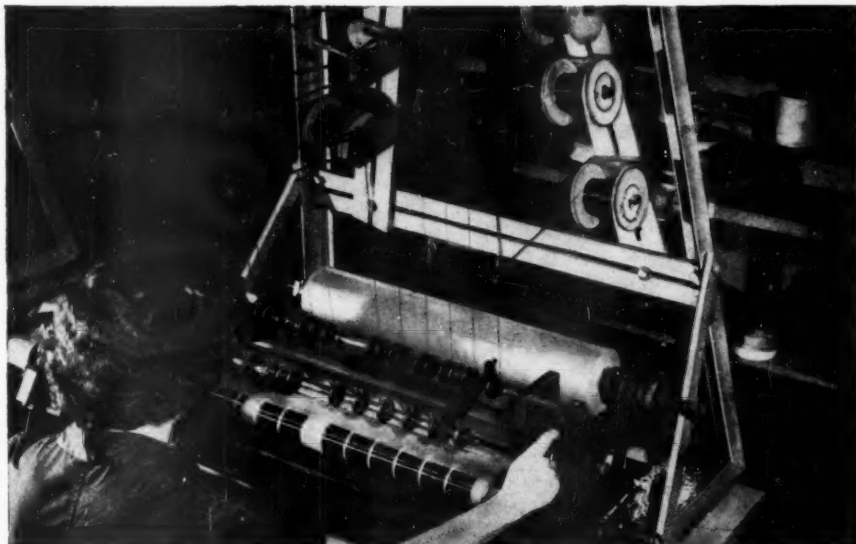
# MAGNET WIRE

***Roebling Roevar retains its high dielectric strength  
under toughest service conditions***

AT RELATIVELY HIGH operating temperatures, Roebling Roevar Magnet Wire has extraordinary resistance to the embrittlement, cracking and loss of toughness that cause damage to ordinary insulations. And besides that, Roevar is absolutely tops for high speed winding. Its insulation is 10 to 40 time more abrasion-resistant than conventional enamel . . . it bends and stretches to an exceptional degree without cracking or loosening from the con-

ductor. It has a better space factor than wire with enamel and cotton, silk, cotton or paper insulation . . . and costs less, too!

A large share of Roebling's wide line of electrical wires and cables is required in the rearmament program, but we'll do our best to meet your requirements. Write today for full information and samples of Roevar. John A. Roebling's Sons Company, Trenton 2, New Jersey.

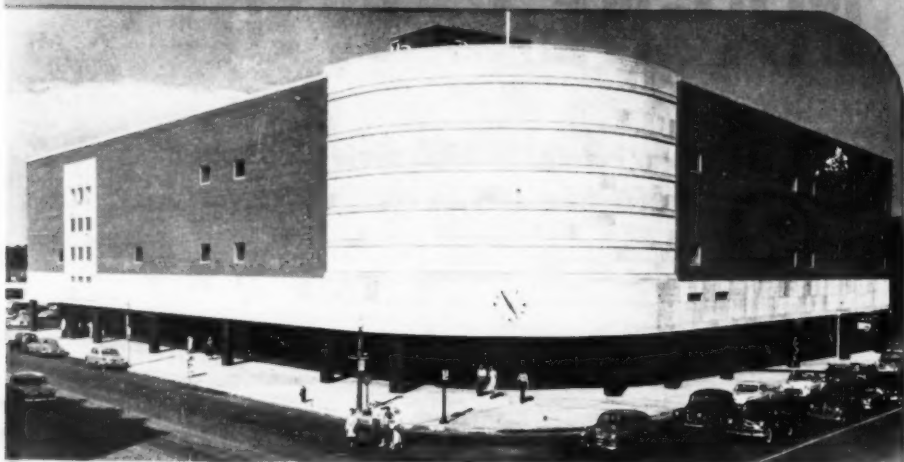


# ROEBLING

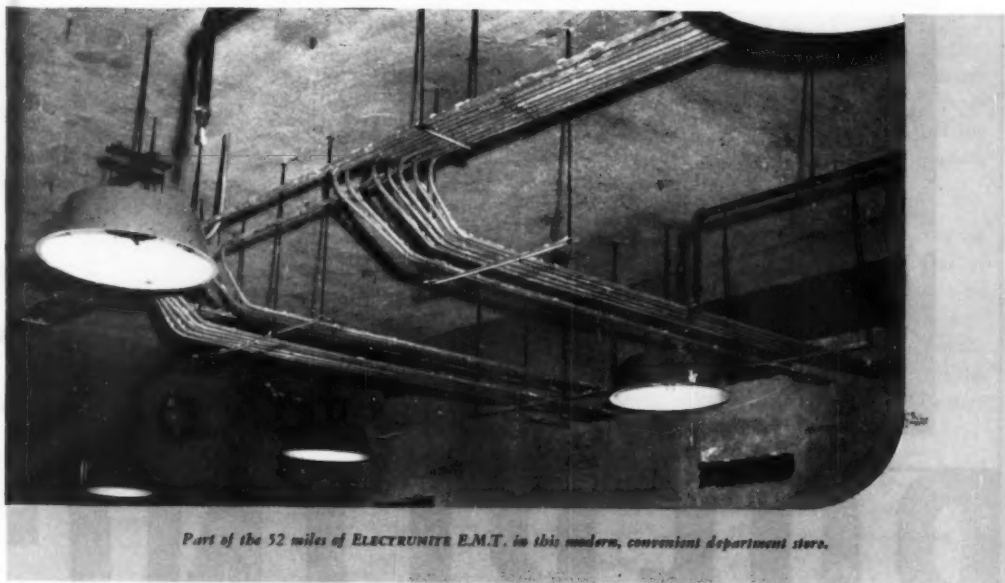
Atlanta, 934 Avon Ave \* Boston, 51 Sleeper St \* Chicago, 5525 W. Roosevelt Rd \* Cincinnati, 3253 Fredonia Ave \* Cleveland, 701 St. Clair Ave, N.E. \* Denver, 4801 Jackson St \* Detroit, 915 Fisher Building \* Houston, 6216 Navigation Blvd \* Los Angeles, 216 S. Alameda St \* New York, 19 Rector St \* Odessa, Texas, 1920 E. 2nd St \* Philadelphia, 230 Vine St \* San Francisco, 1740 17th St \* Seattle, 900 1st Ave, S. \* Tulsa, 321 N. Cheyenne St \* Export Sales Office, Trenton, N. J.



*Famous-Barr Company's "Southtown" department store. P. John Hawer and Associates, Architects; William C. E. Becker, Structural Engineer; John D. Falvey, Consulting Mechanical Engineer; S. C. Sachs & Company, Electrical Contractor.*



## FAMOUS-BARR'S "South Town"



*Part of the 52 miles of ELECTRUNITE E.M.T. in this modern, convenient department store.*

---

**REPUBLIC STEEL CORPORATION**

**STEEL AND TUBES DIVISION**

**224 EAST 131st ST. • CLEVELAND 8, OHIO**

---



*It's easy to work with ELECTRUNIT E.M.T. the original strong-and-light rigid steel raceway.*

## IS WIRED WITH ELECTRUNIT E.M.T.

More than 52 miles of ELECTRUNIT E.M.T. protect the lighting and service circuits in the new, convenient Famous-Barr "Southtown" store in the heart of South Side Saint Louis. The electrical contractor, S. C. Sacks & Co., estimates that this amount of ELECTRUNIT E.M.T. could normally protect the wiring in an eleven-story building.

ELECTRUNIT E.M.T. is the original strong-and-light rigid steel raceway that protects wiring from mechanical damage and moisture. It provides the protection of a grounded system against stray electrical currents. It's the conduit that journeymen and maintenance men like to work with . . . easy to cut and bend . . . easy to line-up and pull-up tight without turning whole lengths of raceway. Concrete-tight connectors can

be tightened with only two wrenches.

Only ELECTRUNIT E.M.T. is "INCH-MARKED" in the popular sizes to permit accurate bends and stubs . . . only ELECTRUNIT E.M.T. has inside knurling to speed kink-free wire-pulling.

Write for the free booklet that illustrates basic bending information. Address: Steel & Tubes Division, Republic Steel Corporation, 224 East 131st Street, Cleveland 8, Ohio.

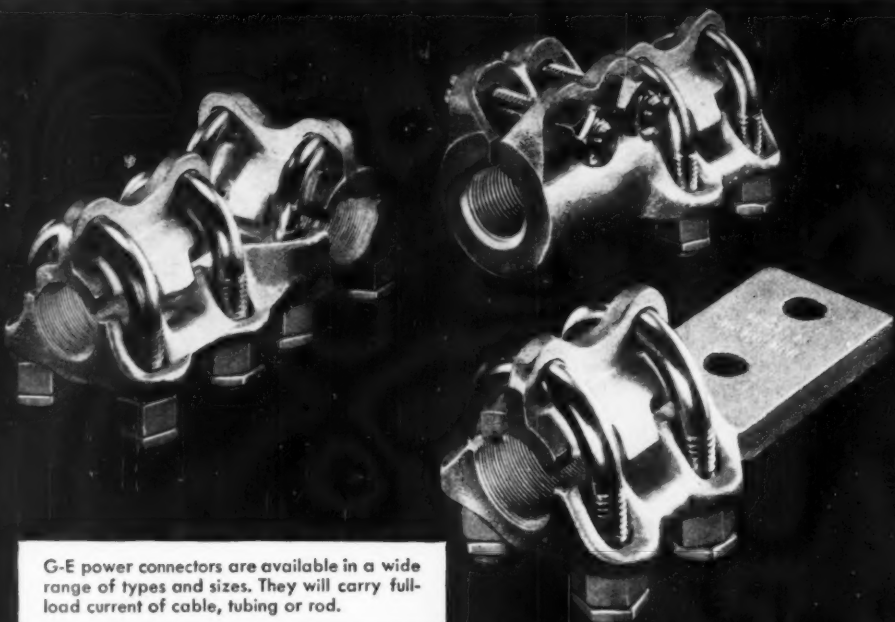
### DO YOUR ELECTRICAL MATERIALS SHOPPING EARLY!

When essential construction has NPA approval, give your requirements to your ELECTRUNIT distributor as far in advance of your delivery date as possible. He will then have a better chance to deliver your materials on schedule.

**Republic**  
**ELECTRUNIT E.M.T.**



LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY



G-E power connectors are available in a wide range of types and sizes. They will carry full-load current of cable, tubing or rod.

## Make power connections and forget 'em . . . when you use G-E Power Connectors!

With G-E power connectors, you get a permanent, high conductivity joint that resists vibration and maintains positive contact with the conductor at all times.

**Low contact losses** Silver on all current-carrying surfaces minimizes contact resistance—protects against formation of troublesome copper oxide. Interlocking sides confine cable strands within the enclosure, reducing inter-strand resistance. Carefully regulated copper content of connector alloy assures current-carrying ability equal to that of conductor. As a result, G-E connectors “run cool”—preventing oxidation through overheating.

**High mechanical strength** Sharp, machine-serrated contact surfaces bite into the conductor—providing extremely high pull-out strength and the ability to resist vibration. Noncorrodible hardware of high-strength bronze alloy maintains permanent tightness. G-E power connectors will not twist, distort or season crack.

Types include straight, tee, block, angle, expansion, ground and many others. Why not place a trial order with your G-E sales representative today? Write for Bulletin GEC-400—it contains 44 pages of valuable connector information. General Electric Company, Schenectady 5, N. Y.

856-77

GENERAL  ELECTRIC



# CROUSE-HINDS

## SAFETY

2-Wire, 3-Pole

## Grounding Plug Receptacle for OBROUND CONDULETS

It gives you a positive  
ground circuit and will  
not accept ungrounded  
3-pole attachment plugs

- 1 A duplex receptacle designed in accordance with the new standards established by NEMA and approved by ASA.
- 2 Has two parallel blade current carrying contacts and one "U" - shaped grounding contact.
- 3 The receptacle takes the new plug caps with two parallel blades and one "U" - shaped or round grounding blade. It also takes the standard two blade parallel non-polarized and two blade parallel polarized plug caps.

This safety grounding plug receptacle for Obround CONDULETS is one of the thousands of items in the complete CONDULET line. Use sturdy cast Feraloy CONDULETS and rigid conduit on every installation.



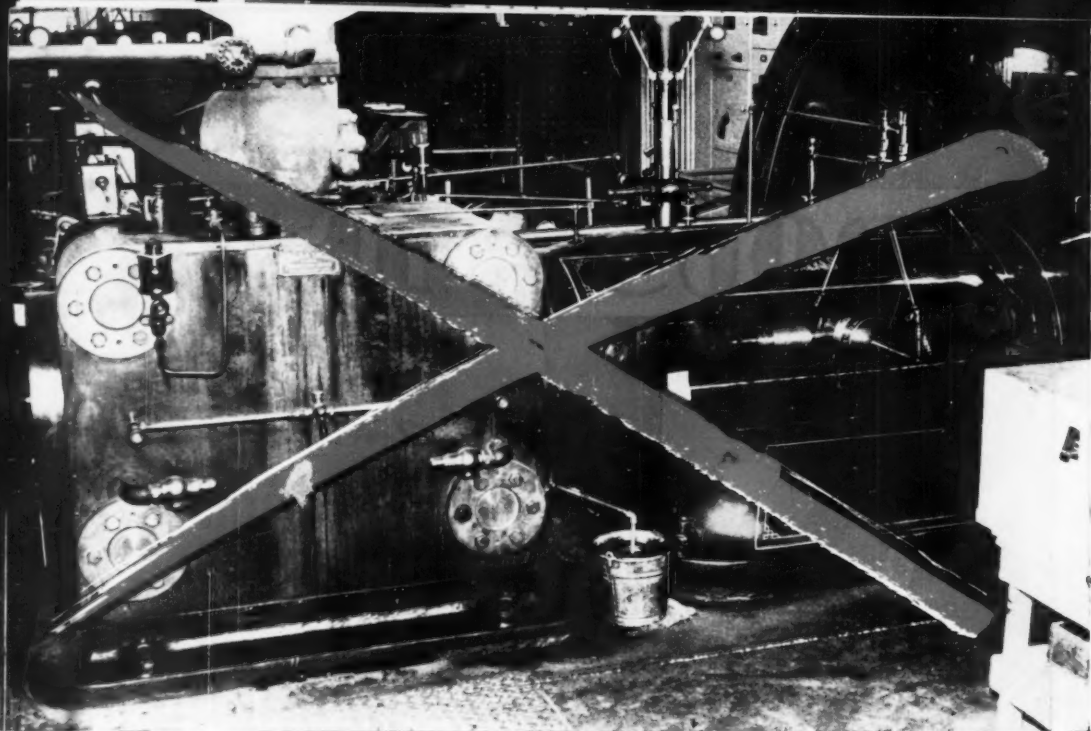
**CROUSE-HINDS COMPANY**  
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee — Minneapolis — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — Washington. Resident Representatives: Albany — Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va. — CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.

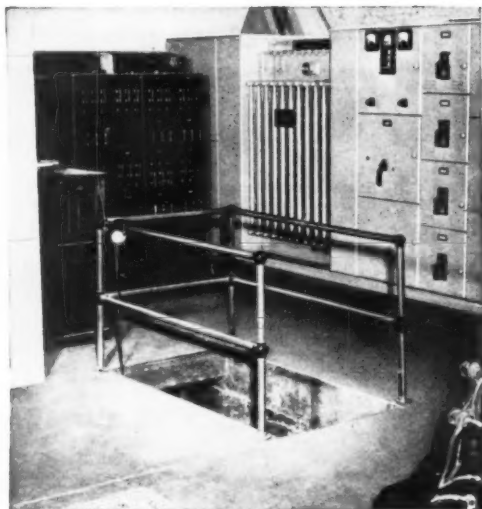


(CONDULETS are made only by CROUSE-HINDS)

**CONDULETS • TRAFFIC SIGNALS • AIRPORT LIGHTING • FLOODLIGHTS**



# Obsolete power supply completely

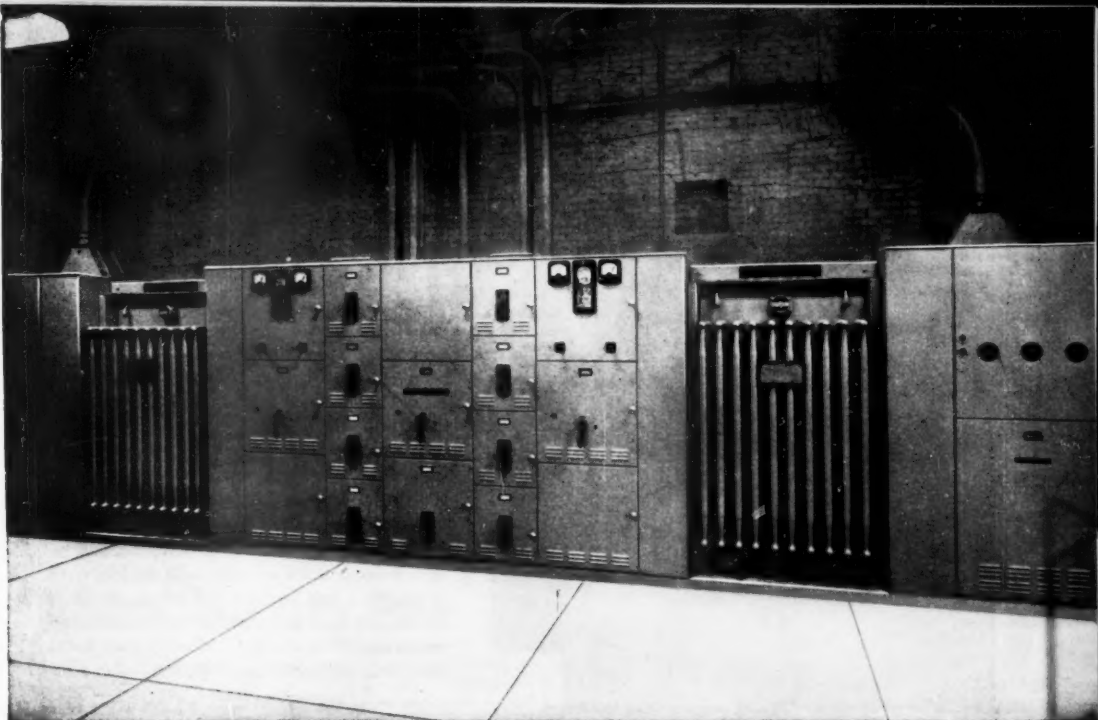


**G-E LOAD CENTER UNIT SUBSTATION** was installed without interruption of the plant's power. Sectionalized design permitted the two-step operation in which the generator's load was thrown on one transformer before the steam engine and generator were removed.

**THE STEAM-DRIVEN GENERATOR** pictured above supplied much of the power used by the Illinois Cabinet Company. Rated at 500 kva, it was severely overloaded much of the time. Failures of steam, engine and generator resulted in costly shutdowns.

The company could have saved \$9500 in power costs if it had been purchasing the power it generated in 1947 and 1948. In addition, it would have avoided the expense of handling 56 carloads of coal.





# replaced without plant shutdown!

## **G-E load center system saves Illinois Cabinet Company \$4500 annually—simplifies future expansion**

Plagued by costly power failures and poor voltage conditions, the Illinois Cabinet Company, Rockford, Illinois, called in the General Electric Company for a complete remodeling of its power system.

In place of the old 500-kva, 240-v steam-driven generator, G-E engineers suggested a 1000-kva load center unit substation and the purchase of *all power from the local utility*. In addition, they proposed a new feeder system to simplify the existing circuits, reducing voltage drop and copper losses. Calculations showed that power costs could be cut by \$4500 annually.

To minimize lost production time, the double-ended load-center unit was installed in two sections

since it could not be completely assembled until the old steam engine was removed. After the first section was installed, the generator's load was thrown on the new transformer. Then the steam engine and generator were removed and the second section was fitted into place. In two week-ends the transformation was complete.

You, too, can get a power distribution system adapted to today's constantly changing production picture. See your G-E sales representative, or write for Bulletin GEA-3592 Load Center Unit Substations and GEA-5600 "Electric Power for Industry's Third and Biggest Expansion." General Electric Company, Schenectady 5, N. Y.

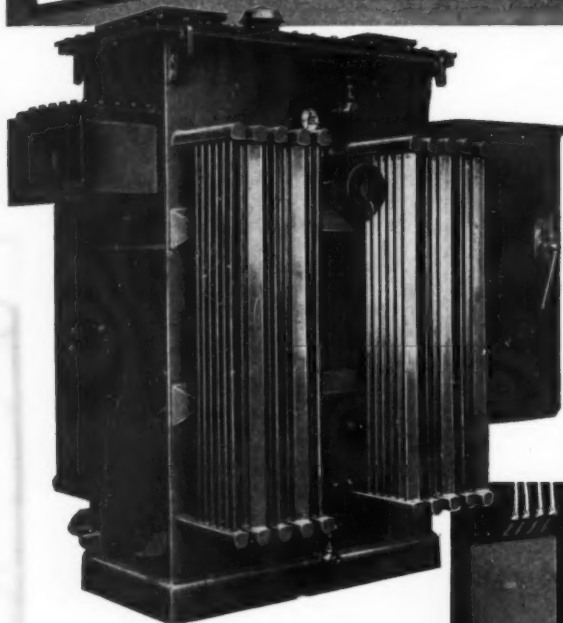
**GENERAL**  **ELECTRIC**

121-79

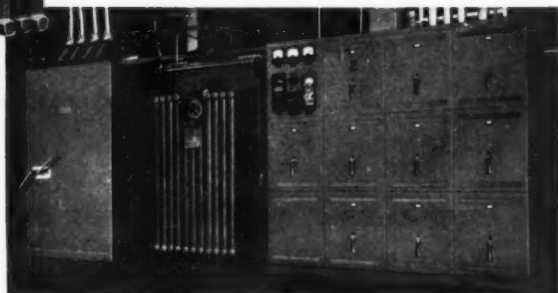
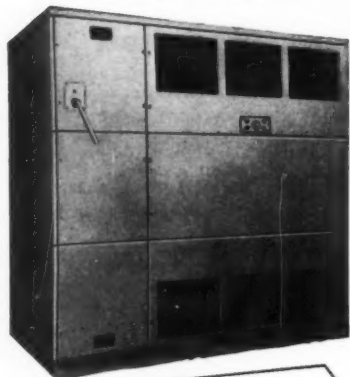
**Wagner®  
TRANSFORMERS**  
... the choice of leaders  
in industry

# Wagner UNIT SUBSTATION TRANSFORMERS

DESIGNED FOR PLANT POWER DISTRIBUTION SYSTEMS



Wagner-equipped unit substation  
in a synthetic textile plant.



## Dry-Type Indoor Transformers

Wagner now furnishes three-phase dry-type transformers in ratings up to 2000 kva in the 15 kv class and below. These units are compactly housed in neat, attractive enclosures, which can be arranged to include primary and secondary switchgear compartments to form readily accessible, closely-coupled unit substations. Relatively light in weight, so that they can be used in multi-story buildings, they are readily adaptable to any installation requirement.

**WAGNER ELECTRIC CORPORATION**

6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES  
AUTOMOTIVE BRAKE SYSTEMS - AIR AND HYDRAULIC

**BRANCHES IN 31 PRINCIPAL CITIES**

**Wagner**  
Electric Corporation

1891 **WE** 1951

# BUS DUCT IS FLEXIBLE

## For Fast Tool Change-Over... A Plug-In Every Foot

Here are two big jobs Westinghouse Bus Duct can do for you. One . . . provide a secondary power distribution system that is quickly and economically installed. Two . . . provide power at the point of use that is flexible for change-overs at any time.

Prefabricated sections of Westinghouse Duct, in any required length (10-foot maximum), are convenient to handle and mount. Ordinarily difficult or tight layouts are no problem with standardized tees, elbows and cross-overs. Simply suspend with cantilever hangers and bolt units together.

Plug-in receptacles every foot speed machine tie-ins, simplify the job of changing over or adding to production lines—without changing the distribution system. No wire mazes to unravel. No cable to splice. To relocate duct, just dismantle, rearrange, remount. All equipment is salvageable. Production line down time is held to a minimum.

For the full story, call your Westinghouse distributor, or write for Manual B-4272-A, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-30060



YOU CAN BE SURE.. IF IT'S  
**Westinghouse**

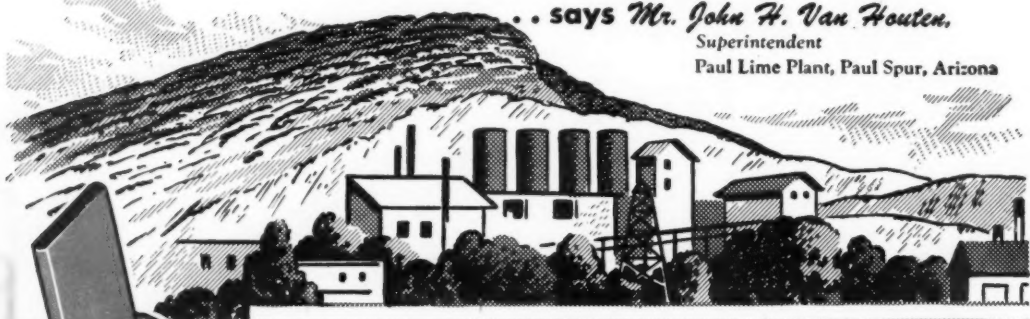
**BUS DUCT**





**"The cost of changing to  
FUSETRON dual-element FUSES has been  
paid for more than ten times over  
in sustained production time"**

*... says Mr. John H. Van Houten,  
Superintendent  
Paul Lime Plant, Paul Spur, Arizona*



## HERE'S HOW

"Prior to February, 1948 we used ordinary renewable fuses throughout our plant. They gave us short-circuit protection but we lost a great many motors due to single phasing, excessive heating and climatic conditions.

"When a motor goes out in a plant like ours, it costs us a loss in production that is difficult to make up.

"In February, 1948 we changed the whole plant over to Fusetron fuses. On the motors we installed a size to give motor running protection.

"We have completely eliminated motor losses due to single phasing and believe we have better all-around protection than before.

"Our records show that the cost of changing to Fusetron fuses has been paid for more than ten times over in sustained production time.

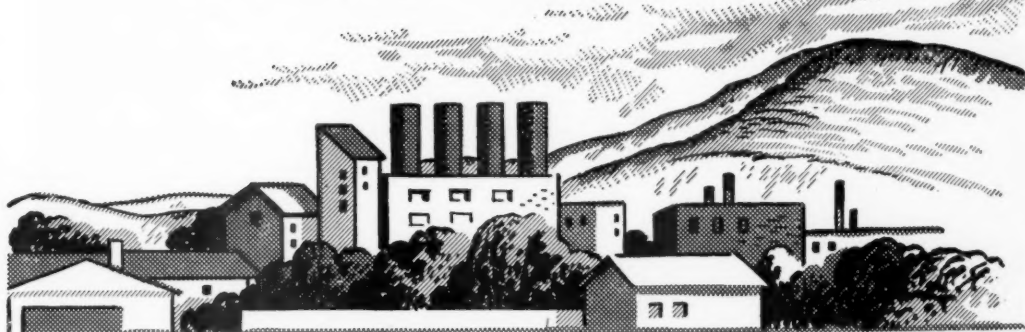
"What more could we ask?"

*John H. Van Houten*

(Fusetron is a trade mark of the Bussmann Mfg. Co.,  
Division of McGraw Electric Co.)



# You Too, Can Cut Production Losses and Save Many Times Their Cost by Changing to FUSETRON dual-element FUSES



## HERE'S WHY

### FUSETRON dual-element FUSES GIVE 10 POINT PROTECTION

- 1\* Protect against short-circuits.
- 2 Protect against needless blows caused by harmless overloads.
- 3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
- 4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.
- 5 Protect motors against burnout from overloading.
- 6 Protect motors against burnout due to single phasing.
- 7 Give DOUBLE burnout protection to large motors — without extra cost.
- 8 Make protection of small motors simple and inexpensive.
- 9 Protect against waste of space and money — permit use of proper size switches and panels.
- 10 Protect coils, transformers and solenoids against burnout.

\*Fusetron fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

### DON'T RISK LOSSES!

One **lost** motor . . .  
One **needless** shutdown . . .  
One **destroyed** switch or panel  
One **burned out** solenoid . . .

May cost you far more than  
replacing every ordinary fuse  
with a  
Fusetron dual-element Fuse.



### USE THE COUPON

Please send me complete facts about FUSETRON dual-element fuses.

Name

Company

Address

City & Zone  State

Bussmann Mfg. Co.,  
University at Jefferson,  
St. Louis 7, Mo.,  
(Division of McGraw Electric Co.)

ECM-12-51



## OUTDOOR INDUSTRIAL LIGHTING



Inadequate lighting such as this makes it difficult to guard your plant boundaries properly. For a moderate

investment most plant protective lighting systems can easily be modernized and made much more effective.

# Now, plug up the loopholes in your outdoor lighting



A continuous, well-planned system can double the protection offered by fences and walls. Plan now to give your plant the protection of a complete lighting system.

As the need for protection increases, as you move back into two- and three-shift schedules, a modern outdoor lighting system becomes more and more important to your production picture.

**FOR PROTECTION**, investigate the low-cost benefits of a soundly planned protective lighting system. New techniques, new types of fixtures, or minor adjustment of your present equipment can bring your lighting up to date for a very moderate investment.

**FOR SAFETY** in handling outdoor traffic, look into today's techniques of improved area lighting for loading platforms, docks, parking facilities, and roadways.

**FOR INFORMATION** on outdoor lighting, contact the lighting specialist at your local G-E office, or write for the free bulletin, "Outdoor Lighting for Industrial Plants." Address Section 451-165, General Electric Company, Schenectady 5, N. Y.

# GENERAL

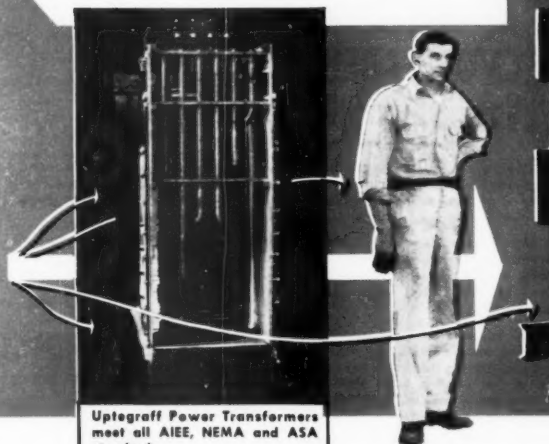


# ELECTRIC

451-165

For your  
**HIGH VOLTAGE**  
requirements

**Uptegraff**  
**POWER**  
**TRANSFORMERS**



Uptegraff Power Transformers meet all AIEE, NEMA and ASA standards.

Built to meet standard or special requirements, Uptegraff High-Voltage Power Transformers are made in sizes through 10,000 KVA, for use on all voltage systems through 115 KV.

Among the important construction features that contribute to long life and safe operation are: strong, rigid tanks, designed to withstand full atmospheric pressure for vacuum filling; radiators designed for ready access for cleaning and painting; synthetic rubber-impregnated cork gaskets, with gasket stops to prevent

over-compression; positive-positioning tap changers with high-compression contacts; shot-blasted tanks finished with three coats of lasting paint.

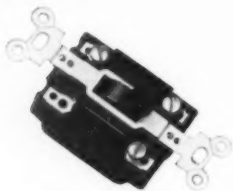
Uptegraff offers complete engineering, manufacturing and testing facilities, including 1.5-million volt impulse generator now being installed.

We will be glad to have your inquiry for High-Voltage Power Transformers built to meet your particular needs.

**R · E · UPTEGRAFF MANUFACTURING CO.** SCOTTDALÉ PENNSYLVANIA  
Makers of POWER · DISTRIBUTION · INSTRUMENT · SPECIALTY TRANSFORMERS

## TIPS

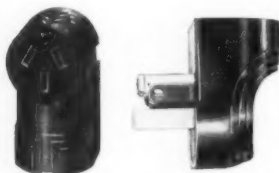
### FOR BETTER WIRING



**NEW BACK-WIRED** or top-wired switch. Quick, easy to install. All connections positive — no wire bending or looping necessary. Complete line for all needs.



**POLARIZED DEVICES.** Single, with outlet box cover shown. Duplex and many other varieties available. Complete range: 10, 20, 30, 50 amperes, 2, 3, and 4 wires.



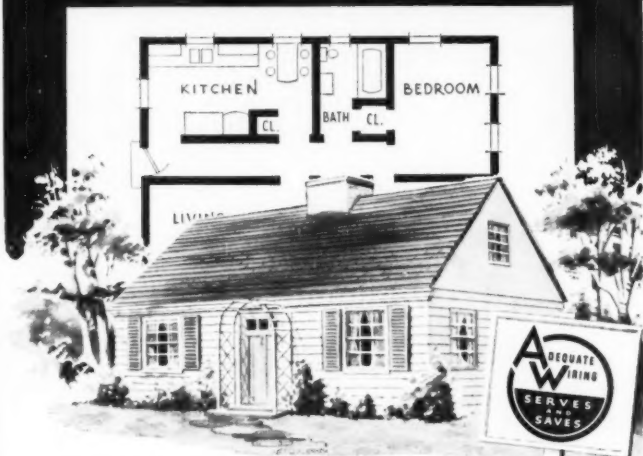
**SURFACE RANGE** and power outlets, easy to wire and easy to install. Complete line of receptacles, connectors, and caps also available. 50A, 250V.



**FOR OUTDOOR** installations exposed to weather . . . for **INDOOR** installations exposed to excessive humidity.

Complete line of switches and combination switches and receptacles available. Also Duplex types.

## BUILD YOUR REPUTATION with a *BETTER JOB* *DONE FASTER...*



### PROMOTE ADEQUATE WIRING WITH **H & H** WIRING DEVICES

You can save money and wiring time on the job, by insisting on adequate wiring and quality wiring devices for every contract. It costs only a few extra dollars to do a certified wiring job during construction. But the addition of a single outlet after construction becomes a costly proposition.

So plan for your customer's maximum needs. Rely on H & H's complete line of dependable, service-proved wiring devices to fill the bill. Once installed, H & H wiring devices render a lifetime of service. Remember — build with adequate wiring and with H & H wiring devices. You'll build reputation — and that builds your business.

Through a series of messages like this, we are reminding architects of the importance of adequate wiring and wiring devices to themselves and everyone in the building field. Good Housekeeping Building Forum booklet "Electrical Planning in the Home" sent on request.

Branches in: Boston, Chicago, Cleveland, Cincinnati, Dallas, Denver, Detroit, Los Angeles, New York, Philadelphia, San Francisco, Syracuse  
In Canada: Arrow-Hart & Hegeman (Canada) Ltd., Mt. Dennis, Toronto



CALL YOUR NEARBY  
ELECTRICAL DISTRIBUTOR  
FOR PROMPT  
SERVICE

For more information, write today to:  
1712 Laurel Street  
Hartford 6, Conn.

**WIRING  
DEVICES**



**ENCLOSED  
SWITCHES**

**THE ARROW-HART & HEGEMAN ELECTRIC COMPANY  
HARTFORD, CONNECTICUT**

*Saving Money...*

## S&C Switchgear Units offer BIG SAVINGS in cost of substations, also

More and more plants are buying their power at high voltage. If the relatively high cost of small substations has slowed down your plan to purchase power at high voltage you'll be glad to know about S&C Switchgear Units. They offer such important savings over conventional circuit breaker equipment that they make high-voltage supply economical even for small plants.

Utilizing Alduti Interrupter Switches and SM Power Fuses, S&C Switchgear Units provide the switching performance and short circuit protection described below. In addition they provide:

- ① *One-package (unitized) metal-enclosed construction.*
- ② *Ease and economy of installation* because all equipment within each unit is factory assembled and connected. Incoming and outgoing connections are readily accessible.

### Typical Performance Characteristics of S&C Switchgear Units

#### VOLTS

2,300 to 34,500

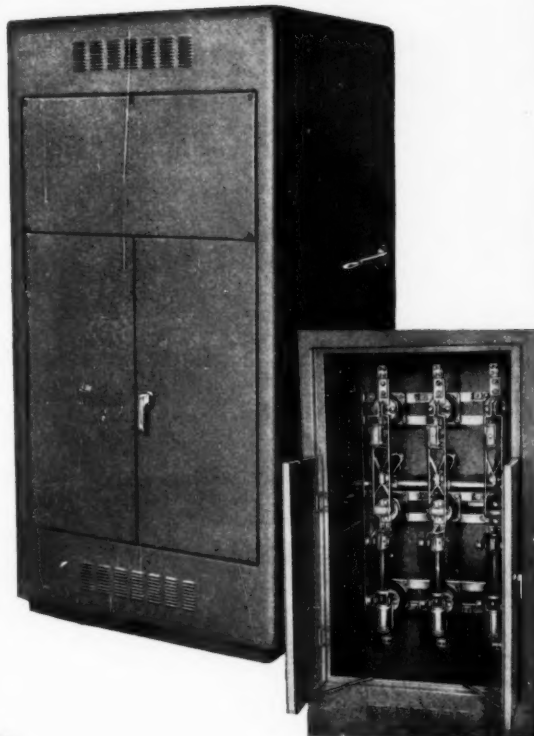
#### AMPERES

Switches: 600, continuous and interrupting  
Fuses: 400, continuous, to 15,000 volts  
300, continuous, to 34,500 volts

#### SHORT CIRCUIT PROTECTION

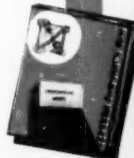
Expressed in 3-Phase KVA  
104,000 at 2,400 volts  
180,000 at 4,160 volts  
448,000 at 13,800 volts  
715,000 at 33,000 volts

## by buying power at high voltage?...



- ③ *Minimum maintenance expense* since a blown fuse is fully restored by simple field replacement of its refill unit. Moreover, under usual conditions the switch requires no maintenance.
- ④ *Service continuity* since the reliability of S&C Power Fuses eliminates outages from surge-caused "sneakouts."

48-page booklet is yours for the asking. Consult telephone directory for S&C representative or write us direct.



# ELECTRIC COMPANY

Formerly SCHWEITZER & CORRAD, INC.

4433 Ravenswood Avenue  
Chicago 40, Illinois, U. S. A.

In Canada:



Division, Limited, Toronto





When you need tape —  
here's your **GUARANTEE** of

# ACCURATE

## QUALITY ELECTRICAL TAPES

**Non-Deteriorating  
Easy Tear-Off  
High Tensile Strength  
Maximum Dielectric**

**BLUEPRINT FOR KNOW-HOW!** For over a quarter century, Accurate Tapes has enjoyed a reputation for quality among electrical men everywhere. One reason for this steady demand is the modern plant that continuously manufactures the finest tape that money can buy. ACCURATE specializes in tape making — combining finest materials with experienced methods. ACCURATE tapes for the electrical industry are of consistent excellence — a consistency reflected in every roll bearing the familiar ACCURATE label. The next time you need tape, you'll find it's good business to make your ACCURATE! For complete catalog, call or write The Accurate Taping Co. at Garfield, N. J. — Dept. R.

### ACCURATE FRICTION TAPES



Quality made of highest grade rubber and finest cotton base. Affords maximum mechanical protection. Available in Standard and A.S.T.M. Specification grades.

### ACCURATE RUBBER TAPES



Offers high elasticity, excellent cohesion, high dielectric strength and superior aging qualities; made in both Standard and A.S.T.M. — A.A.R. grades.

### TAPE TIPS: FOR ELECTRICIANS



Use rubber tape that coheres without heat or extra pressure. That's Accurate Tape! Easier to apply and actually improves with age. Remember — it's Accurate Rubber for greater electrical strength, Accurate Friction for positive mechanical protection!

### ACCURATE PLASTIC TAPE



Thin caliper reduces bulk in tight spots. Strong mechanicality and offers high dielectric strength. Recommended for use wherever plastic tape is practical.

# ACCURATE YOUR BEST BUY IN TAPE

MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

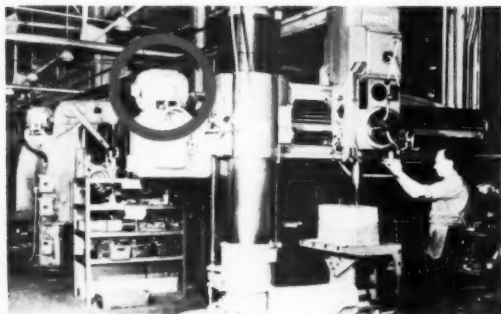




"We have three shifts in operation," says Julius J. Domonkos, Vice-President in Charge of Manufacturing, Bell Aircraft Corporation. "That's full production on a 24-hour day basis. For the past 10 years we've been depending on Tri-Clad motors to carry the load. We've never regretted putting our confidence in this fine motor!"

#### **BELL AIRCRAFT CORPORATION:**

**"We've been depending on Tri-Clad\* Motors for Ten Years..."**



This Tri-Clad driven radial drill takes care of most of the large dies for the entire Bell plant. Big dies and bolster plates are drilled and tapped on this machine, a critical part of the Bell operation. Despite continuous use, plant personnel can't remember a single interruption due to Tri-Clad failure!

\*Reg. trademark of General Electric Co.

G-E Tri-Clad Motors drive the machines that are instrumental in producing helicopters, guided missiles, rocket motors, research aircraft, and jet aircraft engine nacelles for our rapidly expanding armed forces. At Bell Aircraft Corporation, G-E Tri-Clads are known as a thoroughly dependable motor—tough on the outside...on the inside...at the bearings.



**FASTEST BOMBER IN THE WORLD!** Jet engine nacelles for the 600-plus miles-per-hour B-47 are being produced at a record-breaking clip in the Bell plant at Buffalo, N. Y. The "Stratojets" represent a major advance in bombardment aircraft. ➡

**GENERAL  ELECTRIC**



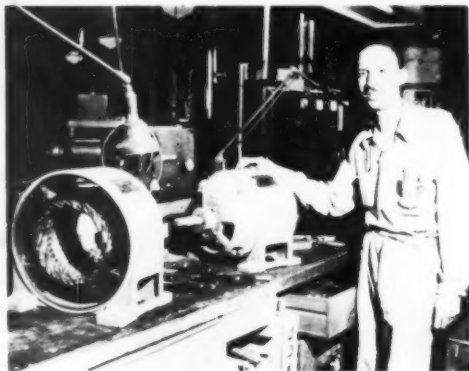
## TRI-CLAD MOTORS

REG. U.S. PAT. OFF.

Help keep Bell Aircraft production up!

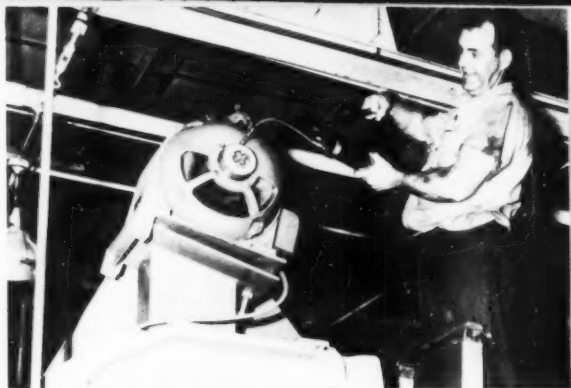


**Marvin Limburg (left), Foreman of Bell's Tool and Die Shop,** comments, "I don't believe we've ever lost machine time due to breakdown of Tri-Clad motors. And our jig-borers, for example *have been operating around the clock for the last 8 to 10 years!*"

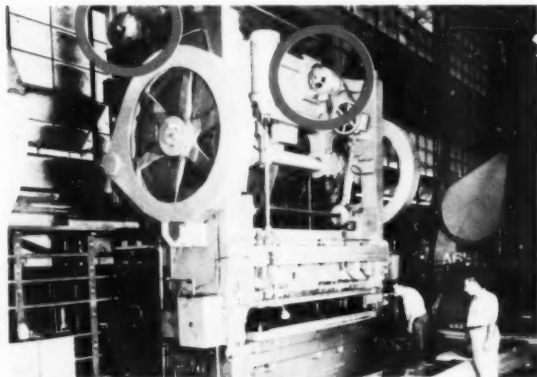


"It's the easiest motor we have to maintain" according to Maxwell Anderson, Crew Chief of Bell's motor repairmen. "There's more working room inside and more room in the slots. It's become a byword with us that if you give a Tri-Clad motor ordinary care you'll never have to worry about maintenance."

**TIMELY READING**—With every electric motor needed on the line, you'll want a copy of the G-E manual on "How to Maintain Motors and Generators." It's free; just ask for bulletin GET-1202. Sect. 752-10, General Electric Company, Schenectady 5, N. Y.



**Greasing isn't necessary** on a Tri-Clad motor in normal service, but it's always reassuring to know that you *can* lubricate if you so desire, without time-consuming disassembly. The photo shows how easy it is: remove relief plug, attach the grease gun nozzle, squirt—the job is finished.



**This huge punch press** is an important tool maker. Anton Geiser (right), assistant punch press foreman, says: "I can't recall a single shutdown of this section due to motor failure." Almost all motors in this department are Tri-Clad. This is another Bell Department which has been operating around the clock; cannot afford to lose time because of motor breakdown.

### NEW! A Helpful Training Course on Motors!

Everyone concerned with technical training problems will want this new G-E Motor Selection and Application Course. Consists of 9 short, easily understood lessons. Complete kit—slide films, review booklets and instructor's manual—\$100.00. Call or write your nearest G-E sales office.

Look at the Scope of this Course



- |                              |                            |
|------------------------------|----------------------------|
| 1. Fundamentals of Motors    | 5. Single-phase Motors     |
| 2. Types of Motors           | 6. D-C Motors              |
| 3. Fundamentals of Selection | 7. Synchronous Motors      |
| 4. A-C Induction Motors      | 8. Adjustable-speed Drives |

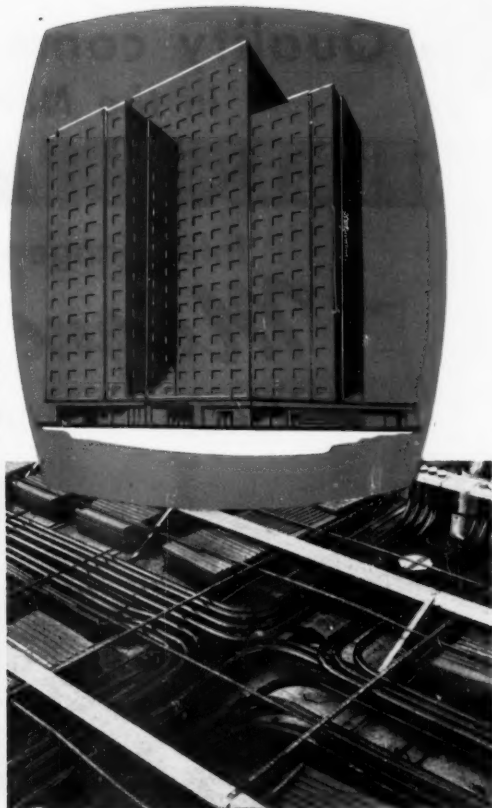
9. Gear Motors

GENERAL  ELECTRIC

# SPANG CENTRAL CONDUIT

carries Power, Light and  
Communication Networks

in **PITTSBURGH'S**  
**ULTRA-MODERN CARLTON HOUSE**



Newest hotel in the expanding steel capital, Carlton House will play an important part in Pittsburgh's future as a center of business and social activities. In its construction every effort was made to provide the most advanced facilities and services.

Throughout this ultra-modern structure a Spang Central Conduit system carries the vital electrical and communications wiring—a typical example of the dependence architects and contractors place on Spang quality and workability for use in major building projects.

In Carlton House you'll find Spang "Cenlaco" and "Central Black." In other new buildings on Pittsburgh's modern panorama contractors are installing all types of Spang Central Conduit. These Spang-Chalfant products are available through leading distributors, everywhere—ask for them by name.

Architect:  
J. Wallace Dixon  
Consulting Engineer:  
Korotky, Waller & Gooch  
Owner and General Contractor:  
Ring Building, Inc.  
Electrical Contractors:  
E. C. Ernst, Inc. and  
The Howard P. Foley Co.,  
John Veinsten



## SPANG-CHALFANT

Division of The National Supply Company

GENERAL SALES OFFICE:  
GRANT BUILDING, PITTSBURGH 30, PA.

District Offices and Sales Representatives  
in Principal Cities

Quality comes to the front  
in the NEW  
**HEINEMANN**

Interchangeable  
*Magnette*  
CIRCUIT BREAKERS



Fully  
Magnetic—  
Non Thermal

Not  
Affected  
By Heat

The attractive, stream-lined "Magnette" is interchangeable with many other conventional breakers. It can be snapped into place in many panelboards and load centers, thus making it unnecessary to replace complete equipment.

But the "Magnette" is much superior in performance to ordinary breakers. It operates on the FULLY MAGNETIC, NON-THERMAL principle, in which a short circuit causes the breaker to trip

without waiting for any elements to heat. Tripping on short circuits is thus instantaneous.

In addition, the "Magnette" carries full rate current continuously without being affected by changes in surrounding temperature. A magnetic-hydraulic time-delay device permits passage of inrush current or minor overload for a safe time interval. An arcing chamber equipped with a unique "quench wall" assures long contact life.

When you buy panelboards, be sure they are equipped with  
HEINEMANN Magnette Breakers



**HEINEMANN ELECTRIC COMPANY**

132 PLUM STREET

TRENTON, NEW JERSEY

# 15% Smaller

## IN SIZE AND WEIGHT

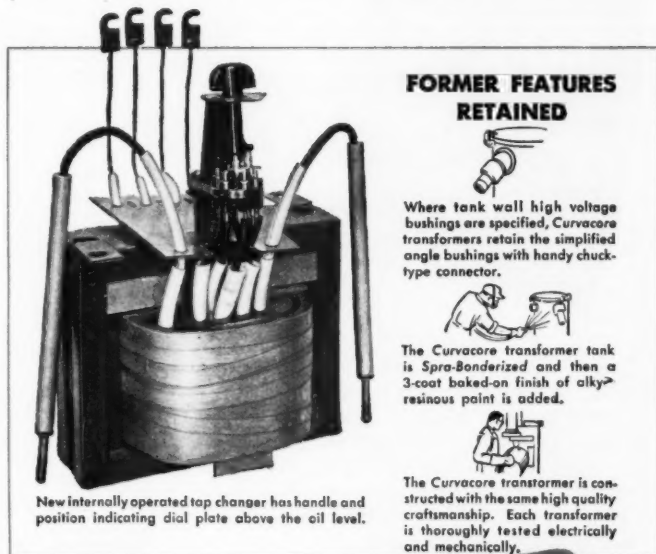
## WITH SAVINGS IN OPERATING COSTS

**Y**OU CAN GET higher flux carrying capacity and lower hysteresis losses with the new *Curvacore* distribution transformer. The new transformer with its redesigned core and other improvements gives better performance though reduced in size and weight 15%.

The core of the *Curvacore* transformer utilizes strips of cold rolled steel, shaped to follow the natural path of the magnetic flux. Steel strips are wound, shaped, annealed and cut into two-turn lengths. Each length is fed through the coil structure and then resumes its original curved shape.

The *Curvacore* transformer can yield real savings in operating costs over the years. Here are the advantages of the new design:

- 1 **EXCITING CURRENT REDUCED BY ONE-HALF**  
Wound core design provides a more efficient path for the magnetic flux.
- 2 **BETTER RATIO OF COPPER-IRON LOSSES**  
New core design gives better balanced arrangement of core steel to copper.
- 3 **REGULATION IMPROVED UP TO 15%**  
Low reactance of design results in lower impedance.
- 4 **THERMAL CAPACITY IMPROVED**  
Increased cooling area within the windings reduces the copper-to-oil temperature gradient. Improved cooling results in added years of service life.
- 5 **SIZE AND WEIGHT REDUCED BY 15%**  
The reduction in size and weight makes the *Curvacore* transformer easier and cheaper to handle and to install.



### FORMER FEATURES RETAINED

Where tank wall high voltage bushings are specified, *Curvacore* transformers retain the simplified angle bushings with handy chuck-type connector.

The *Curvacore* transformer tank is *Spra-Bonderized* and then a 3-coat baked-on finish of alky resinous paint is added.

The *Curvacore* transformer is constructed with the same high quality craftsmanship. Each transformer is thoroughly tested electrically and mechanically.



Economies resulting from these features mean all-around savings for your system and make the *Curvacore* transformer a good investment.

The *Curvacore* transformer is now available in ratings of 25 kva and lower. Higher ratings will soon be available.

For more information on the new *Curvacore* distribution transformer, call your local A-C sales office or dealer. Or write Allis-Chalmers, Milwaukee 1, Wis.

A-3418

Curvacore is an Allis-Chalmers trademark.

# ALLIS-CHALMERS





# OKOLITE-OKOPRENE® CABLES

Stand up against

## HEAT, MOISTURE and COLD

Bring Circuit Security  
to Falls City Brewery Company  
Louisville, Kentucky

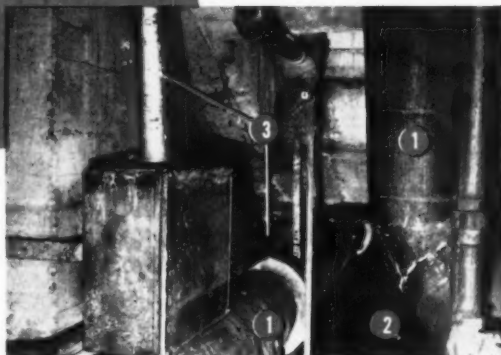


No braids to rot—resists moisture, ozone, sunlight, oil, chemicals, flame—simple construction—flexible and long-lived.

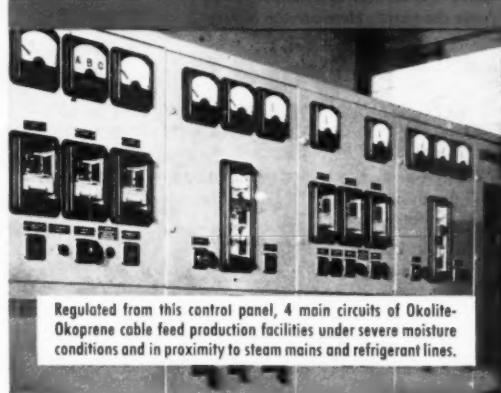
Heat, moisture and refrigeration along the feeder circuits constantly threatened the power supply at the Falls City Brewery Company. A utility tunnel, carrying steam, gas and water in addition to the main power lead to the brewhouse and bottle shop, was the principal problem. Here, as in so many other process industries where power interruptions cannot be tolerated, OKOLITE-OKOPRENE cable was used.

Wherever rugged industrial operating conditions are found, electrical engineers specify service-proved OKOLITE-OKOPRENE cable. They take advantage of the Okonite program of constant research to provide longer-lived cables. They know Okonite's exclusive strip process... how the insulation and the sheath are applied simultaneously and vulcanized *only once* in a metal mold, assuring perfectly centered conductors, a more stable and longer-lived insulation and sheath.

Industrial plants, railroads, mines and utilities insist upon OKOLITE-OKOPRENE cable for long-term dependability and economy... management too, knows Okonite standards. For further information on OKOLITE-OKOPRENE cables, write for Bulletin EC-1053. The Okonite Company, Passaic, New Jersey.



Surrounded by steam mains<sup>(1)</sup> and moisture<sup>(2)</sup>—even occasional flood conditions—Okolite-Okoprene cables<sup>(3)</sup> carry power to brewhouse and bottle shop through this utility tunnel.



Regulated from this control panel, 4 main circuits of Okolite-Okoprene cable feed production facilities under severe moisture conditions and in proximity to steam mains and refrigerant lines.



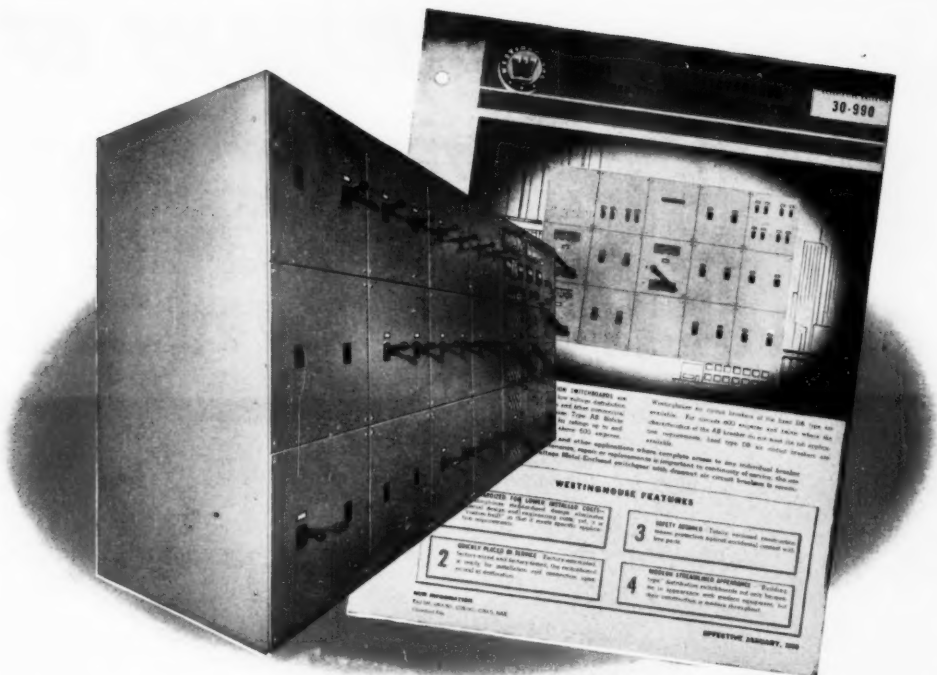
# OKONITE

SINCE 1878

THE BEST CABLE IS YOUR BEST POLICY

insulated wires and cables





## Check these Advantages of Westinghouse "BUILDING-TYPE" Distribution Switchboards

Specifically designed for control of low-voltage distribution circuits in commercial buildings, Westinghouse Building-Type Switchboards provide low-cost circuit protection with these advantages:

... Where Westinghouse Type AB Nofuze "De-ion"® Circuit Breakers up to 600 amperes are suitable, these compact breakers keep cost and space to a minimum.

... Where circuit requirements are such that AB Breakers cannot be used, and for ratings above 600 amperes, stationary mounted Westinghouse Type DB Air Circuit Breakers are used.

Further, standardized design permits incorporating both Type AB and Type DB Breakers in the same structure.

Standardized design also makes installation easier, because switchboards are shipped as

single structures or complete boards, depending upon your handling facilities.

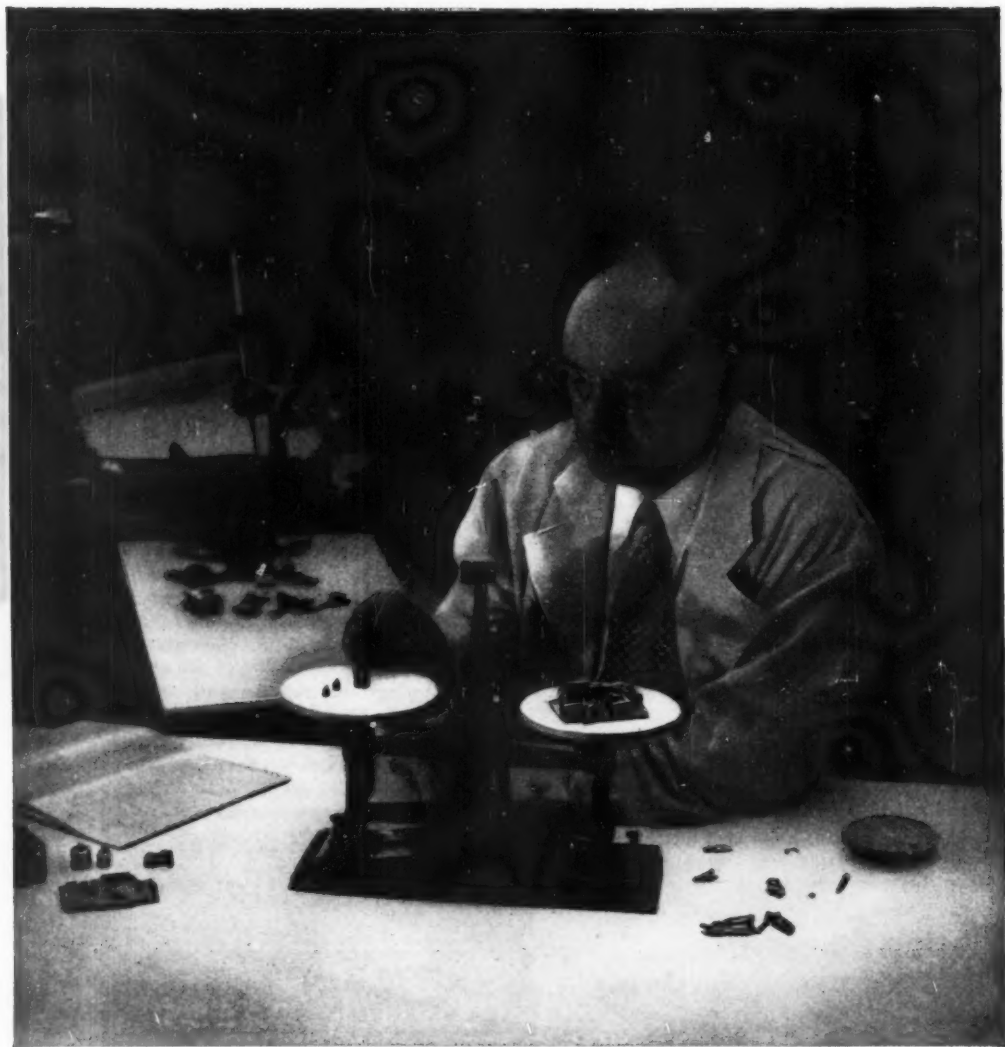
Bulletin D.B. 30-990 gives the complete story on how to figure your requirements quickly and simply.

You can make selections right from this catalog. Structural numbers, operating parts and assemblies with layout instructions are illustrated, described.

Your Westinghouse representative will be glad to give you a copy of the booklet, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-93468



# *MILLIONS OF* HERE ARE THE



# Stab-loks...

Registration Applied For

# REASONS WHY

STAB-LOKS pass the same exacting U. L. electrical tests as the highest priced A.C. circuit breakers. And now *mechanical comparisons* of the five most popular breakers give still further proof that Stab-lok gives you most for your money.

- Stab-lok is a BIG, FULL-SIZE BREAKER!
- Stab-lok has FEWER and MORE RUGGED parts!
- Stab-lok uses metal where it counts — CARRYING CURRENT!

... a whole combination of features that make Federal Noark Stab-lok the best breaker at any price.

## INDEPENDENT LABORATORY TESTS OF FIVE POPULAR CIRCUIT BREAKERS SHOW:

Brand	Total No. of Parts	No. of Fibre Parts	% Total Weight	% Total Weight of Case and Handle	% Total Weight of Metal Parts	% Total Weight of Current Carrying Assemblies
STAB-LOK	22	1	100.0	100.0	100.0	100.0
C	31	5	82.2	76.8	88.0	53.8
E	24	2	83.8	80.4	83.3	48.7
B	28	1	85.4	56.0	97.6	48.7
D	31	5	82.2	76.8	88.0	53.8

Stab-loks have been on the market for only a year and a half . . . yet today millions are in service and the demand is growing by leaps and bounds. And no wonder!

Stab-lok is the lowest priced breaker on the market whose dependability has been absolutely proved in service. Now you can give customers the safest, most convenient circuit protection at fuse box prices. What's more,

Stab-lok is easy to install and, thanks to Federal Noark mass production, you can usually expect better deliveries than of any other breaker.

Remember Stab-loks are an ideal stock item for your shop and trucks . . . order them from your wholesaler.

Federal Electric Products Company,  
50 Paris Street, Newark 5, N. J.

## FEDERAL NOARK

Complete line of Federal Electric Products includes Motor Controls, Safety switches, Service Equipment, Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct \* Sales offices in principal cities.



# **ONLY TIREX** **HAS THE** **SELENIUM** **NEOPRENE ARMOR**

Only Simplex-TIREX cords and cables are jacketed with the famous Selenium Neoprene Armor. This famous cured-in-lead jacket is well known wherever tough, hard jobs are found. Whether it is coal mining, ship building, open pit mining operations, rock quarrying or foundry work the tough, cured-in-lead jacket provides the kind of staying power that you want. Wherever rough, abrasive conditions are found, there you will find the jobs that TIREX excels at doing.

Actual service records show that Simplex-TIREX cords and cables have proved to be the most economical because the Selenium Neoprene Armor lasts so long.

Whenever your requirements call for the use of a portable cord or cable, specify and be sure that you get Simplex-TIREX Cords and Cables.

*If it isn't made by Simplex it isn't Tirex*



**Simplex - WIRES & CABLES**

**SIMPLEX WIRE & CABLE CO.**  
79 SIDNEY STREET,  
CAMBRIDGE 39, MASS.

# Washington Report

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**Electrical equipment production slowdown** is resulting from lack of copper for electrical manufacturers during last half of 1951, will delay completion of many industrial projects up to six months. Situation is result of imbalance in allotments of copper and other metals between industries, and miscalculations of essentiality of electrical products to the expansion program. NPA is striving for quick solution, should get bigger share of copper supply for this industry in future.

**Copper conservation measures** already adopted by electrical equipment manufacturers reduce copper content of their products up to 10%, they told DPA and NPA officials recently and reported copper conservation and substitution has been under continuous study by most companies in the electrical industry for some time (See "In the News").

**Essentiality of conduit** for wiring systems was stressed by the Electrical Conduit IACommittee during its Nov. 14 meeting, held in Washington under NPA sponsorship. The Committee also made three major recommendations designed to prevent disruption of normal distribution of conduit for defense and civilian use. (See "In the News")

**CMP decentralization** has been effected by NPA by assigning more CMP-4B applications to Field Offices. New basis is to hold applications for large quantities of materials in Washington for each product code totaling 75% of the controlled materials for that code. Result: applications processed in Washington will be reduced about two-thirds, reduce paper-work there.

**DO-ratings** for other than military and AEC orders (A, B, C and E) might well be abandoned, many mobilization planners believe. Present system sets up priority for military and AEC orders, virtually puts all other rated orders on open-market basis same as non-rated orders for which CMP allotments are still being made. Alternative is creation of multiple-band ratings. Most IAC meetings being held currently include this subject on agenda for discussion with industry members.

**Structural steel allotments**, fair guidepost for construction, will be substantially the same for 1st quarter 1952 as for last quarter 1951—less than half the stated requirements of the various claimants.

NPA's Facilities and Construction Bureau gets the biggest chunk—360,000 tons, 63% of its stated requirements. This will fully meet the needs of the steel and aluminum expansion programs, provide a high percentage of needs for other important expansion. Second biggest chunk goes to Department of Defense—171,000 tons, 89% of request. NPA's Railroad Equipment Division gets 170,000 tons, 61% of request, and DEPA gets 143,000 tons, 77% of request.

FSA's schools got 22,800 tons, 48% of request, and hospitals got 15,500 tons, 59% of request. This will provide materials for continuing construction on all elementary and secondary school projects under way and permit more than 300 new starts.

**Retailers** who normally sell copper wire, nails, or other controlled materials to the general public may now self-certify orders for limited quantities with W-5 rating under terms of NPA Order M-80, issued November 19.

**Ceiling price regulations** affecting various segments of the electrical industry include: CPR 67—New or Unused Machinery and Equipment; CPR 80—Used Machine Tools; CPR 93—Construction (EC&M, Nov. 1951, p. 67)

# CRESCENT ENDURITE

## DUAL PURPOSE WIRE & CABLE

*makes the most efficient  
use of critical  
materials*



Listed by Underwriters' Laboratories as  
TYPE RH-75° C OR TYPE RW-60° C

In *DRY* locations ENDURITE insulated wire and cable with its superior heat-resisting characteristics, is rated as a Type RH with higher permissible operating temperature and consequently greater carrying capacity.

In *WET* locations this same wire with its excellent moisture-resisting qualities is rated as a Type RW.

Except where voltage drop is the determining factor, CRESCENT ENDURITE when used as a Type RH allows the use of a smaller size of cable and in many cases smaller size of conduit at less cost than would be required for Type R or Types T or TW for the same load.

Usually in sizes No. 6 A.W.G. and heavier for power circuits and No. 1 A.W.G. and heavier for lighting circuits CRESCENT ENDURITE as TYPE RH will give the lowest cost per ampere of useful circuit capacity.

For branch circuits requiring small size conductors, Voltage Drop is the determining factor in the choice of conductor size.

There is also a definite advantage to you in the REDUCTION OF STOCKS as this one wire will meet all your building wire requirements for both the usual dry location and the occasional wet location.

*Send for Bulletin giving Comparative Current-Carrying Information*



**CRESCENT INSULATED WIRE & CABLE CO.**

Trenton, New Jersey, U. S. A.





# DECEMBER . . . at a Glance

## Painless Wiring Design

You will wonder, as we did, why it hasn't been done before. But to Carl Bredahl of Westinghouse Better Homes Bureau, goes credit for one of the most useful helps in house-wiring design we have seen in many years. His "Home Wiring Estimator" (see Engineered House Wiring, page 60) is a form which simplifies calculation and assists Code compliance and design adequacy. For those of us who have laboriously scratched out these calculations with frequent reference to many sections of the Code forms like this ought to greatly simplify the procedure.

## Contractor Cooperation

From the looks of their offices, several Milwaukee electrical contractors can promote and sell planned lighting with the assurance that comes from personal experience. Their own headquarters and offices are models of planned lighting techniques. To see what they have done, be sure to catch Charles Laupp's picture story "They Practice What They Preach in Lighting" on page 56.

## Will Home Wiring Suffer?

Does the 35 pound copper limitation force lower house-wiring standards and limit Adequate Wiring? One test is to calculate the weight of copper in actual wiring plans and find out. Herb Cook of the Detroit Electrical Association did just that over a fairly large sample of new homes and comes up with some assurance that, with proper layout, adequate wiring designs are possible within the

weight limitation. His report "Will Copper Shortage Strangle A/W?" begins on page 49. Without in any way questioning Cook's good work, however, we persist in taking a dim view of what we believe to be a wholly arbitrary and unnecessary control device, an argument which we present in further detail on this month's editorial page.

## Labor Curves

Most of us know from practical experience that erratic job manning can prove expensive and wasteful. Ray Ashley has tackled the problem with his usual keen insight into matters of this kind and has come up with a valuable study on how manpower demand curves can vitally affect expended labor on electrical construction projects. His suggested optimum demand curve indicates that the estimator may find a manpower demand curve projection a vitally important part of his cost estimate. Be sure to read "Know Your Labor Curves" on page 58.

## Job Mechanization

The importance of modern tooling to job and shop management can hardly be overemphasized. During the coming months all of our staff will be alerted to seek out some of the better examples of job mechanization that they can find in their travels and on the jobs they visit. This month Gus Eckel writes about an automatic bus bar bender as one example of shop prefabrication methods used by Barnes & Brass Electric Co. who have found mechanized construction techniques save hundreds of man hours. The story "Motorized Copper Bar Bender" appears on page 51.

## DATES AHEAD

Plant Maintenance Show—Convention Hall, Philadelphia, Pa., January 14-17, 1962.

American Institute of Electrical Engineers—Winter general meeting, Hotel Statler, New York, Jan. 21-25.

Southeastern Electrical Wholesalers Assn., Inc.—Second annual "Industry Day" meeting, Atlanta Biltmore Hotel, Atlanta, Ga., January 24-25.

15th Annual Electrical Industry Convention and Trade Exposition—North Central Electrical Industries, St. Paul Hotel, St. Paul, Minn., Feb. 24-28.

National Electrical Manufacturers Association—Edgewater Beach Hotel, Chicago, Ill., March 10-13.

National Industrial Service Association—Annual convention, Stevens Hotel, Chicago, Ill., April 20-23.

Chamber of Commerce—Annual meeting, Washington, D. C., April 28-30.

4th International Lighting Exposition and Conference—Cleveland, Municipal Auditorium, Cleveland, Ohio, May 6-9.

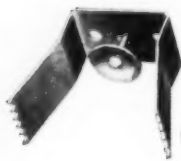
National Association of Electrical Distributors—Annual convention, Atlantic City, N. J., June 9-13.

National Fire Protection Association—Annual meeting, Hotel Statler, New York, N. Y., June 19-20.

New York State Association of Electrical Contractors and Dealers, Inc.—Saranac Inn, Saranac, N. Y., June 29-July 7.

Illuminating Engineering Society—National Technical Conference, Edgewater Beach Hotel, Chicago, Ill., September 8-13.

# Our Very Own!



**SBS**—Strong, secure mounting in all kinds of wall materials. Can be pulled tighter at any time.

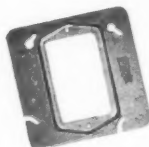


**40-X**—Especially for remodeling work. Conductors run under new fired-out walls. No disturbing old outlet.

The Racó line of switch and outlet boxes is much more than an unusually complete line, designed to meet every need and preference in its field. Almost every item (like the four examples shown) has some special feature, Racó engineered to make that unit just a little better than run-of-the-mill merchandise. That's why Racó is the line to stay with.



**RDD**— $3\frac{1}{4}$ " deep boxes for modern tile or block walls.  $1\frac{1}{4}$ " deep boxes for "thin-wall" partitions.



**4" Square Covers**—New unique mounting hole arrangements. Covers mount horizontally, vertically without removing screws.

You can always rely on **RACÓ**

# RACÓ

**ALL-STEEL EQUIPMENT Inc.**—800 Kensington Ave., Aurora, Illinois

**"A BOX FOR EVERY NEED"**

## **House Wiring Limits**

**CAN YOU WIRE A HOUSE** with 35 pounds of copper? That is the amount allocated under construction controls. Herb Cook makes a good case for the affirmative in the following article. But we want to take exception, not to Cook's excellent work, but to the whole idea of an arbitrary and entirely irrelevant method of control.

**READING THE FINE PRINT**, 35 pounds is just the limit of self-authorization. But the claimant agency has made it clear that it will not look favorably upon requests for more. So, in effect, the figure is an actual limitation and builders have rarely, to risk understatement, shown much initiative about providing their customers with more than a minimum of wiring.

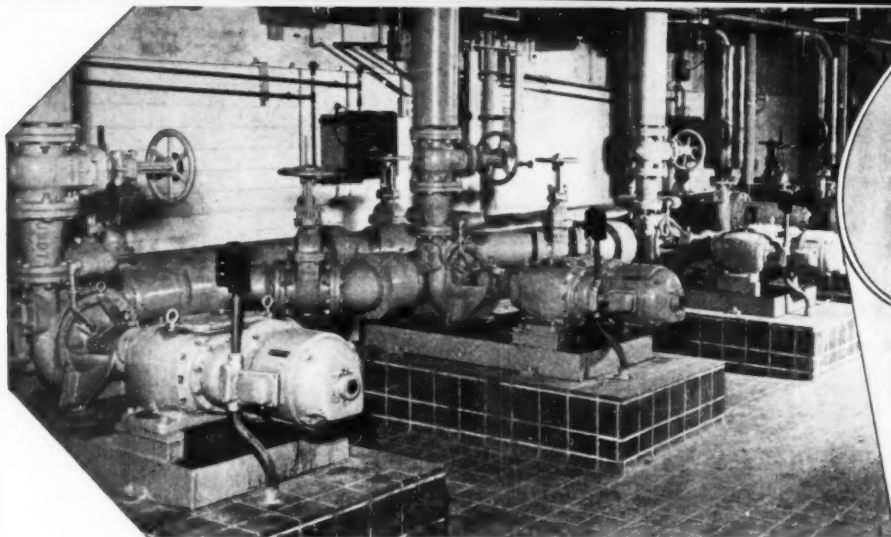
**GOOD WIRING** follows clear-cut rules of design and layout. It serves utilization requirements. It makes economical provision for expected growth. It is safe. It is adequate. Its quality is commensurate with the quality and appointments of the home. It is a prudent investment and a good buy.

**THERE ARE CHARACTERISTICS** which are clearly in the interest of the home buyer, but adverse to the builder. His interest is to spread his copper over as many houses as he can since there is no non-critical substitute. And in this no material is actually saved; it is just spread more thinly, like watering milk to fill more bottles.

**FIXED COPPER LIMITS** can also be exploited to force the use of gas and gas appliances over the public preference for electric. A limit restricting the freedom of commercial choice between the two would deserve full investigation, particularly since copper water piping is permitted in the presence of a satisfactory and less critical substitute.

**WE HAVE SEEN**, over many years of industry experience, a lot of house wiring. None, by any practical appraisal, could be characterized as wasteful of copper. Restrictions on copper, therefore, operate as restrictions on function, use, quality, safety or to place electrical appliances at a distinct commercial disadvantage to competitive lines. We believe these disadvantages and inequities more than outweigh the largely psychological and at best nominal reduction in total copper use intended by the 35 pound limit.

*William T. Stuart*



It's sound practice to specify G-E motors—sound practice, too, to make sure you get the right General Electric motor for the job... via Graybar.

Service under all conditions proves the rugged reliability of the entire G-E Tri-Clad line—motors that are built to take a physical beating... built to deliver smooth, steady power when and where you need it.

Let Graybar be your motor advisor. Your local Graybar

Representative can help you match up motors with customer's machine-drive requirements... help you analyze special installations requiring totally-enclosed motors, variable speed motors, gear motors, or reversible motors.

He can also provide details on the G-E Motor Exchange Plan. Covering popular fractional and integral ratings, this plan makes emergency replacement of inoperable motors a simple over-the-counter transaction.

**GI**

## When production needs more motor horsepower— Look behind the Graybar tag



Before you buy another motor—or for that matter, anything electrical—discover for yourself the many helpful services that stand behind the Graybar tag—services that even today can help you buy with greater speed and efficiency.

A network of over 100 offices and warehouses places Graybar facilities conveniently close-at-hand—regardless of your location.

Local Graybar Representatives can furnish you and your customers with practical advice on the installation and usage of most every-day electrical items. On out-of-the-ordinary installations or where you desire specialized technical information you can get the additional assistance of experienced Graybar Specialists.

Your near-by Graybar office also maintains a comprehensive information service covering all of the more than 100,000 electrical items distributed by Graybar—you'll find it useful in meeting job specifications and arranging practical delivery schedules.

180-412

**G-E quality plus Graybar service.** Graybar distributes G-E controls to match the operating conditions of any motor. A Graybar Power Apparatus Specialist will be glad to recommend the type that's best for any installation.

**GRAYBAR ELECTRIC COMPANY, INC.**

**Executive Offices:**

Graybar Building, New York 17, N. Y.

*Avoid electrical delays—plan ahead... via* **Graybar**

IN OVER  
100 PRINCIPAL CITIES

TABLE I—COMPILATION OF SURVEY DATA

No.	Sq Ft Living Area (D.D.)	Number of Outlets		Pounds of Copper		Number of Circuits		Wire Lengths (Feet)										Total Rooms (Baths Bed-Incl) rooms	
		Installed	Adequate Wiring	Installed	Adequate Wiring	Total	Light	18/2	14/1	14/2	14/3	12/2	8/3	6/3	Misc.				
1.	841	44	55	18.0	22.4	6	2	68	40	489		48	12	15				5	2
2.	.889	41	50	19.9	27.2	6	2	60	23	512		85	35	14				6	2
3.	977	51	59	22.6	27.8	6	2	65	82	686		75	23	12				6	2
4.	980	50	58	22.1	26.8	7	3	64	88	608		44	20	15				6	3
5.	992	62	70	18.5	23.6	7	2	60	82	552		14	24	10				7	3
6.	1026	58	62	22.9	25.2	7	3	53	50	632	14	49	10	12				6	2
7.	1042	59	67	24.1	31.0	6	2	88	115	571	35	82	37	12				7	2
8.	1170	61	68	25.4	29.0	8	3	98	46	607	53	44	15	15				6	2
9.	1170	72	75	35.7	38.2	8	4	91	85	733	158	120	15	15				6	2
10.	1232	82	84	38.2	42.1	9	4	92	126	745	231	103	26	12				7	3
11.	1272	59	72	21.8	25.0	7	3	42	54	631	13	55	10	10				7	3
12.	1314	72	73	28.5	31.7	10	3	68	84	772	25	67	18	15				6	2
13.	1350	63	76	22.6	25.9	7	3	43	54	572	52	51	10	15				8	3
14.	1400	60	68	21.6	25.9	8	4	51	40	588		41	20	15				8	3
15.	1444	53	61	23.4	26.0	7	3	64	50	588	57	48	10	12				7	3
16.	1532	82	90	31.5	34.5	10	4	75	72	966		52	10	15				8	3
17.	1543	66	79	27.2	31.3	8	4	58	79	728	61	67	15	12				8	3
18.	1590	89	94	36.2	38.8	8	3	44	94	973	66	63	12	15				10	3
19.	1604	84	85	40.4	48.7	8	4	110	93	1050	62	114	55	15				8	3
20.	1620	94	99	38.8	41.7	11	5	50	109	1127	63	56	15	15				7	3
21.	1676	71	94	33.0	44.6	12	4	41	26	628	102	38	30		6/2-68'			12	4
22.	1704	123	123	104.0	104.0	17	12	100	30	2300	90	200		66	4/2-6'			9	2
23.	1767	89	94	44.9	48.2	8	4	100	71	1136	27	80	15	20				9	2
24.	2110	79	91	42.5	47.0	8	4	90	49	1247	100	80	15	15				10	3
25.	2465	149	152	49.7	51.4	12	6	71	100	1852	80	76	10		4/3-20'			11	3

## Will Copper Limits Strangle A/W?

ON October 1, housing construction came under the Controlled Materials Plan with a definite limitation on the amount of copper which could be used in each home. Under Schedule I of Direction 1 to CMP Regulation 6, this limit is 35 pounds for a single-family dwelling with a steel pipe water system (160 pounds for a house with copper water piping). Multiple-family dwellings have higher limits (Table I). These values are the limits within which the homebuilder may proceed without advance approval under the "self-authorization" plan.

The above situation raises three questions of vital importance to the homeowner, electrical contractor and those interested in maintaining high

Detroit Electrical Association's Adequate Wiring Bureau survey comes up with a "No" answer—for homes 1,500 sq. ft. or less in area. Here are the facts which led to this conclusion.

By Herbert E. Cook

Executive Secretary  
Electrical Association of Detroit  
Detroit, Michigan

standards of residential wiring:

1. What happens to residential wiring standards?
2. What happens to Adequate Wiring?
3. How much copper is used in wiring the average home and how much wiring can be done under the 35-pound limitation?

To get an answer, Louis J. Schneider,

Adequate Wiring Representative of our Detroit Electrical Association, was assigned to investigate 25 homes without reference to any particular type, builder, contractor, or location. The approach was strictly impartial in every respect. All jobs were inspected after "rough-in" but before wiring was covered up. Thus, he was able to secure an accurate measurement of size

From a paper presented at the 16th Annual Conference, IAEL, New Orleans, La.



TABLE II — Self-Authorization Limits on Copper and Steel

	Homes With Steel Pipe Water Systems		Homes With Copper Pipe Water Systems	
	Steel (lbs.)	Copper (lbs.)	Steel (lbs.)	Copper (lbs.)
Single Family Dwellings	1800	35	1450	160
Two Family Dwellings	3500	65	2750	300
Three Family Dwellings	5100	100	4100	450
Four Family Dwellings	6500	125	5200	575

Half the quantities shown may be self-authorized for an addition, extension or alteration to an existing dwelling.

TABLE III — Copper Weights

Cable Size	Pounds of Copper per 100 feet of Cable	Feet of Cable per pound of Copper
18/2	0.98	102.0'
14/1	1.243	84.5'
14/2	2.49	42.3'
14/3	3.63	28.2'
12/2	3.95	25.3'
8/3	14.99	6.7'
6/1	8.1	12.3'
6/3	24.32	4.1'
4/3	38.28	2.6'

and length of wire installed, and also estimate added copper necessary to comply with Adequate Wiring Specifications.

Because the jobs were in rough-in stage, minimum requirements for basements were taken and no provision was made for finished-off areas such as recreation rooms. Also, no allowance was made for thermostat wiring since these items will not materially affect the final result.

An allowance of 20 feet of No. 6 wire was made for grounding. This, in the majority of cases, is generous in our territory since inspection authorities permit grounding to the nearest cold water pipe instead of requiring connection to the supply side of the water meter.

In these installations, service entrance cable was a 3-conductor No. 6, and range circuits were 3-conductor No. 8. Few homes in our survey used heavier wire for these purposes.

The statistics compiled from this survey present some very interesting facts. They will, I believe, prove many points and answer—among others—the three questions mentioned. Here's what we discovered.

#### Wiring Standards

Of the 25 homes surveyed, 18 comply with the 35-pound copper limitation. The areas of these homes (living quarters) varied from 841 to 2,465 square feet (see Table II). In plotting these values on a graph—square foot area and pounds of copper—we found that an approximate breaking point is 1,500 square feet. When we plotted outlets versus pounds of copper, we found an average range of 50 to 80 or a mean of 65 outlets with a majority in the 65 to 75 range.

Thus, we can say—as a guide—that a residence of 1,500 square feet of living area with 65 to 70 outlets can be

wired within the 35-pound copper limitation.

If we use the National Electrical Code as a standard, I believe we can safely say that our present regulations are not going to lower standards to any great degree. The exception may be where unusually large services are required for electric heating, for luxury type estate homes, or for all-electric homes. These, however, do not constitute a substantial portion of residential construction today on a nationwide basis.

An analysis of 511 Detroit area Dodge Reports for speculative homes showed 494 were under 1,500 square feet of living area, 17 were over. Of 58 custom homes, 43 were below and 15 over the 1,500 square foot level. From our statistics on feet of cable per pound of copper (Table III), it is obvious that unusual loads or unusually long runs of heavy conductors exert a great influence on the installation.

Consequently, with our survey as a guide, it does not seem too hazardous to say that—in the majority of cases, within reasonable limits, the 35-pound copper limitation will not be detrimental to the present standard of wiring based on the National Electrical Code requirements.

#### Adequate Wiring

What happens to Adequate Wiring in this situation is, of course, of great interest to us. In only three of the 18 homes under the limit in our survey do we find Adequate Wiring requirements boosting the weight of copper above the 35-pound figure. Range wiring and added outlets produce the increases. Thus, in 60 percent of our cases analyzed, Adequate Wiring could have been installed.

The greatest increase in copper weight was 11.6 pounds; 4.4 pounds

for the range, 7.2 for 22 additional outlets. The minimum increase for those qualifying and adequately wired was 2.3 pounds; 1.5 for range and 0.8 for added outlets.

Another interesting fact: when we took an average weight-per-outlet-added (not including range) to secure Adequate Wiring, it amounted to 0.2 pound of copper per outlet. In terms of feet of No. 14/2 cable, this was 8.4 feet. Outlets added (excluding range) averaged six per home or a total of 1.2 pounds of copper for additional outlets.

On the basis of this we feel that Adequate Wiring can go forward, possibly on a reduced scale, under present regulations.

#### How Much Copper?

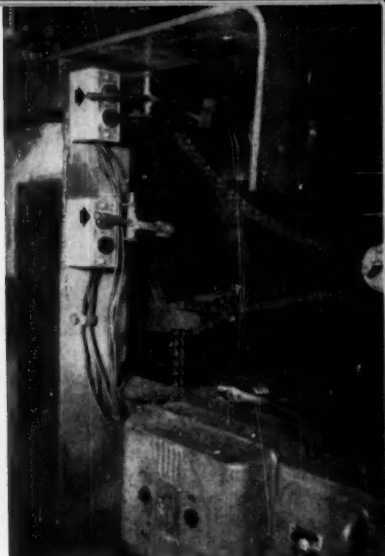
A partial answer as to how much copper is used in wiring the average home and how much wiring can be done under the 35-pound rule is given by the figures in Table II. Much can be done under this limit, and the probabilities are that a substantial percentage of home building is going to be in the 1,500 square-foot category.

Planned or engineered wiring is one way to save copper on residential electrical systems. As an example: we received a set of plans for a speculative builder in a distant city and were requested to develop a wiring layout. On completing the wiring design for this one-story, 1,120 square foot home, we discovered that our layout—including Adequate Wiring and a dryer—required a total of 23 pounds of copper "as engineered." Even when adding 15 percent for "unknown conditions," this home would use only 26.45 pounds of copper. Compare this with home No. 7 in Table I—a good 1,042 square foot speculative house—which used 31 pounds. Although we cannot say that

(Continued on page 150)



**ELECTRIC HOIST** operates motorized copper bar bender equipped with push button and limit switch control. One man can make 20 bends per hour on heavy copper bus with this unit.



**ROD ACTUATED** levers, (arrows), make limit switches of "stop" buttons for bending head closed and open positions.

## Motorized Copper Bar Bender

Mechanized construction techniques save hundreds of man-hours for Barnes & Brass Electric Co. Automatic bus bar bender is one example of shop prefab methods used.

**H**AVE you ever encountered a mechanic who could make up to 20 bends per hour in  $\frac{3}{8}$  inch by 6 inch copper bus bar without a sore muscle in either arm? This has been done many times over at the Barnes & Brass Electric Company, electrical construction firm in Clarksburg, W. Virginia. In fact, more than 10,000 bends were made in this size copper bus—and larger—on a single contract involving substation electrical installation work. And the mechanics liked it because it was primarily a pushbutton operation.

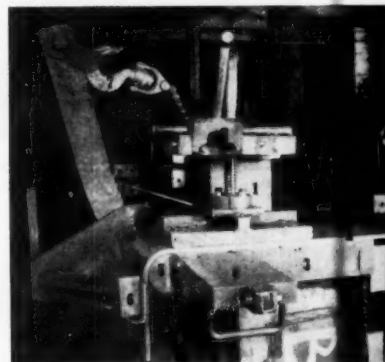
Basis for this accomplishment was an electrically operated copper bus bender designed and built in the B & B shop. "It looks something like a Rube Goldberg contraption, but it does the job and saves considerable man-hours," commented B & B Manager Don G. McKeen, while explaining how the equipment worked.

The unit consists of a heavy I-beam pedestal mounted to a square channel-iron base. A bus bar clamp and bending head are welded to the top of this pedestal. The bed of the bar clamp is

made of heavy steel with a rounded shoulder over which the bar is bent (See Photo). A heavy, steel, box-like bracket (with one side hinged) supports a  $1\frac{1}{2}$ -in. diameter hand screw which raises or lowers the heavy, flat steel "shoe" which, in turn, holds the bus bar securely in place. When closed, the hinged side of this bracket locks the clamp and prevents the bracket from spreading as the hand screw is tightened.

The bending head rotates around a pin extension on the rounded clamp bed shoulder; has welded to it a heavy steel block which actually bends the copper bar around the shoulder; is equipped with two lever arms—a lower one of heavy steel construction and an upper one (almost diametrically opposite) of lighter steel construction. A heavy steel clevis is mounted to the end of each arm.

The bender is powered by a conventional 1-ton "Budgit" electric hoist which has one chain hook engaged in the upper (return) lever arm clevis and the other chain in the clevis of the



**BENDING HEAD ASSEMBLY** consists of: (1) bus bar clamp; (2) bus bar in place; (3) heavy steel "bed"; (4) hinged type clamp lock; (5) machined shoulder around which copper is bent; (6) steel bending block on rotating lever; (7) hoist chain hook on "return" lever. "Bending" lever is almost diametrically opposite.

lower (bending) arm. Support for the hoist is provided by a horizontal I-beam welded near the base of the pedestal. The hoist hook is engaged in a ring post at the end of this beam and the hoist itself is cradled in two angle-iron saddles welded to the beam.

Pushbutton control of the bender is accomplished through a reversing magnetic switch and two conventional "start-stop" pushbutton stations so arranged that they act as limit switches. Pivoted lever arms with attached ac-

(Continued on page 152)



**CONTINENTAL'S NEWEST PLANT** is 16-acre single-story assembly building powered through twin 22000-volt utility lines. Rapid handling of materials is facilitated by 9 enclosed railroad sidings, 15 truck-loading docks, conveyor system and motorized trucks.

## Modern Methods Mean Savings

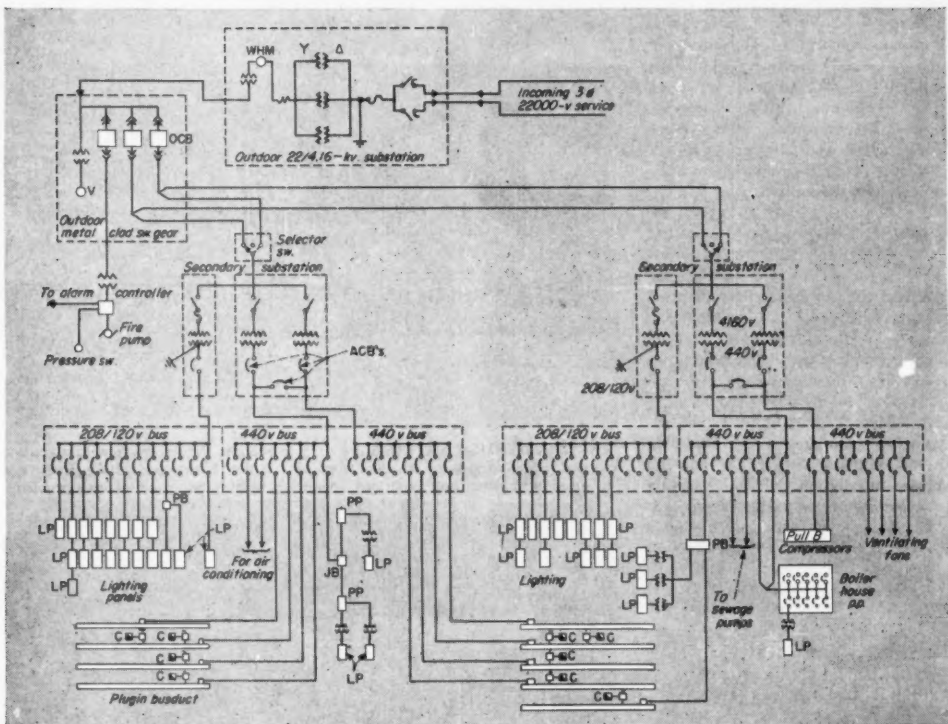
Rated among the top industrial creations of 1950, Continental Can Company's most recent assembly plant merits recognition for adopting numerous methods to electrically safeguard personnel and property, conserve critical materials, assist manpower with horsepower and reduce construction costs.

**By Robert Reed**

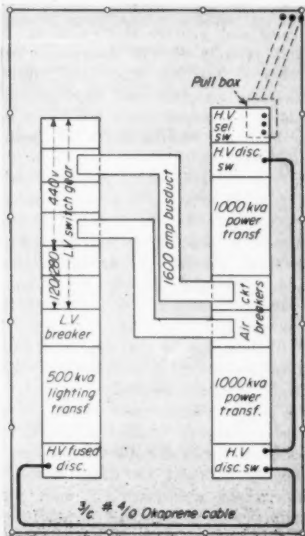
*Plant Engineer  
Continental Can Company  
West Mifflin Borough, Penna.*

**C**ONTINENTAL Can Company's recently-completed \$11-million 16-acre assembly plant in West Mifflin Borough, Pennsylvania, is an outstanding example of modern design, progressive construction and up-to-the-minute electrical distribution. Among the electrical features are load-center substations, balcony-elevated to leave floor space unobstructed for production. Capacitors are on all bus-duct runs to maintain high power factor. Floor-trenched fiber raceways carry high-voltage feeders. Floor ducts in office areas furnish flexible power and telephone service. High-intensity illumination meets the requirements of specific seeing tasks. Electric welders, furnaces and baking ovens speed mass production schedules. Motorized conveyors, cranes and electric trucks facilitate efficient materials handling. Interlocked assembly lines keep products from jamming, and an intercom system combines the features of dialed station-to-station phone calls with plant-wide audible paging.

Conservation of critical materials is evidenced in electrical and structural practices alike. For plastic molded-type low-voltage breakers are utilized at substations, fiber raceways are used extensively, roof panels consist of as-



**DISTRIBUTION** is underground and underfloor to load centers, thence up to balcony transformers and overhead plug-in busducts and feeders for power and lighting. Dual service connects main OCBs with secondary substation selector switches.



**SECONDARY SUBSTATIONS** are balcony mounted, leaving production floorspace uncluttered. Power transformers are grouped on one side of central aisle; lighting transformers and all switchgear on the other. Overhead low-reactance busduct sections connect 440-volt air breakers with their corresponding control cubicles.

bestos-gravel-tar panels rather than steel pans, and walls are formed with relatively new pre-cast light-weight concrete sections. All of these features were incorporated with one objective: to save erection time, dollar investment, weight and allocated metals.

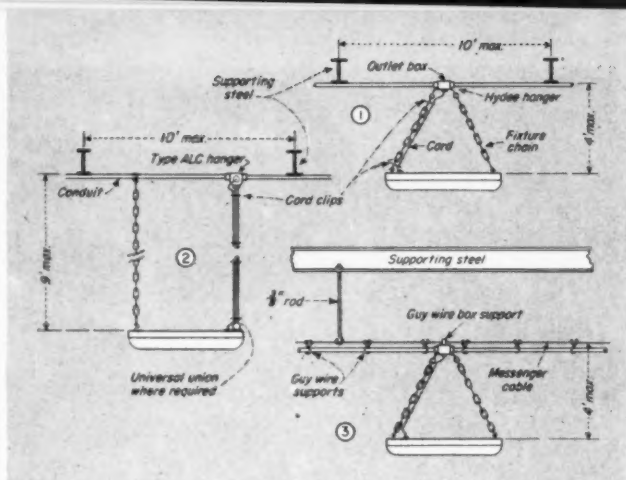
With round-the-clock output capacity close to ten-million cans per day and with storage space at a premium, emphasis has been placed on speeding all receiving and shipping activities. Here again, operation is mainly electrical, with motorized roll-up doors at each of the 15 truck-loading docks and nine enclosed railroad spurs (accommodating 44 box cars for simultaneous handling). Loading areas are provided with thermostatically-controlled unit heaters, signal lights at all entrances to warn personnel of incoming or outgoing cars, and an auto-call paging installation. Rapid stacking or unloading of materials and products is facilitated by overhead monorail conveyers and motorized pallet trucks, and powered capstans to shift freight cars along the platforms. Planned lighting is furnished by liberally-mounted RLM incandescent units. For higher, local illumination, portable floodlights can be plugged into convenience receptacles.

#### Lighting For Utilization

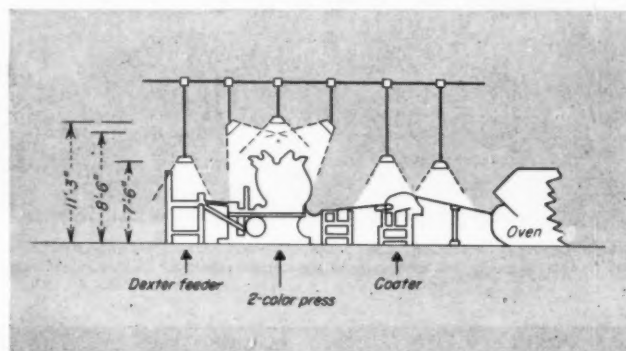
Lighting throughout the plant follows the pattern of area utilization: with vaporproof fixtures in lacquer storage and comp-and mixing rooms, open reflector incandescent units over aisles and general storage areas, 2- and 3-lamp 40-watt fluorescent fixtures in machine shops and offices, and 500- and 1000-watt floodlights illuminating power-house boiler stacks, water tank, parking areas and building exteriors.

Over certain areas where visual perception must be of a higher order, such as over color printing presses and inspection benches, fluorescent reflectors are mounted at varying heights and so directed that an arch of concentrated illumination is formed above the work.

Illumination in the assembly area averages 40- to 50-footcandles, with circuit conduits generally mounted to the under side of roof beams, with Hydec hangers connected to outlet boxes, and with disconnecting fixture-supporting chains and plugs to facilitate rapid replacement of units for maintenance or repair. A variation of this general method finds conduits supported by messenger cables equipped with terminal anchors and turnbuckles and with intermediate rod hangers.



**THREE SUSPENSION METHODS** are used to support fluorescent luminaires, using various combinations of conduit supports, outlet boxes and chain fastenings to meet local structural conditions, mounting heights and maintenance problems.



**CONCENTRATION OF LIGHT** is obtained over 2-color presses by mounting fluorescent fixtures at various heights with reflectors so directed that arch of illumination raises footcandle level to 200 for critical inspection.

Aisles are separately switched, with 3-way circuiting permitting watchmen to light their routes ahead of them as they progress through the plant and to switch the lights off behind them without retracing their steps.

Lighting panels are generally column type, with wireway extensions and pull boxes rising to roof-truss elevation. Wire for lighting circuits is generally type R. Branch conduits are fitted with expansion fittings wherever structural expansion joints are crossed.

Considerable attention was devoted to fire protection; the plant-wide sprinkler system being backed by a 300,000 gallon water tank maintaining a pressure of 125 psi. Should the pressure drop below 100 pounds, two air pressure tanks automatically go into operation and should pressure drop still further to 80 pounds, an electric

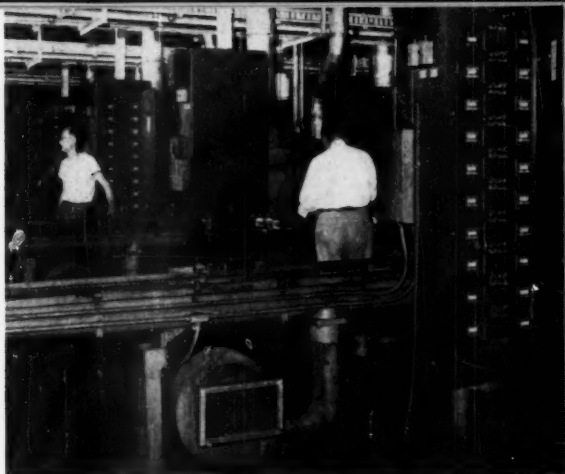
100-hp fire pump automatically starts. In the event of a power failure, a gasoline-driven auxiliary pumping unit is available.

To protect this pumping power against interruption due to a fire within the plant proper, a service feeder is carried from an outdoor 100 kva 3-phase 440-volt transformer directly to the pumping station, without passing through any interior load center or manufacturing section. In addition to the equipment mentioned, the pumping station is equipped with a combined manual-automatic pump controller, pressure switch, alarm system and meter board indicating the extent of corrosion existing on tank-housed anodes. These anodes (10 in all) and 6 cathodes within the tank maintain a constant blanket of hydrogen which clings to the tank shell to minimize the corrosive action on the steel. The

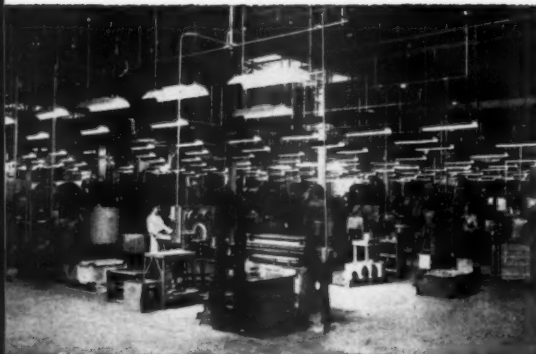




**ELECTRIC WELDERS** speed assembly-line routines, while chain and roller conveyors move products in process rapidly from one operation to the next.



**POWER DISTRIBUTION PANELS**, consisting of interchangeable switch units connected to isolated busbars, provide safety, convenience, dependability and flexibility.



**INDUSTRIAL FLUORESCENT FIXTURES** provide 40- to 50-footcandles to working levels. Overhead conduit grids and drops carry power from busduct to individual machines.



**INFRARED BAKING TUNNEL** is 160 feet in length and contains 1600 lamps with connected load close to 400-kw. Movable sides concentrate heat in minimum area.

sprinkler system is moreover connected to an annunciator alarm and indicating panel, installed in the engineer's office, to show the location of open sprinkler heads in the event of fire.

#### **Underground HV Distribution**

Primary service from the utility network is brought to Continental Can's property line via 22-kv overhead lines, then underground through concrete-sheathed galvanized iron conduit to an outdoor 3750-kva 22-kv/4180-volt delta-wye substation. Metal clad switchgear includes three 3-pole oil circuit breakers rated for 5000-v, 100,000-kva IC. One of these OCB's protects the fire-pump circuit just discussed. Each of the other two 1200-amp breakers are connected to two groups of three single-conductor 500-MCM 5-kv shielded neoprene cables (12 in all) which are carried into the

plant through a 6-cell underground concrete-sheathed fiberduct raceway. At present only four of the raceway cells are in use; the two empty runs providing reserve capacity for extra feeders if and when plant growth requires manufacturing expansion and additional substations. Since the plant was originally designed for 12 assembly lines and 27 lines are already in operation, the probability of installing additional substations and 4180-volt feeders appears imminent.

Two elevated load-center substations step current to 440-volts for production-line power; to 208/120-v for lighting, control and receptacle use. Manually-operated load-break selector switches make it possible to establish service through either of two sets of conductors rising to platform level through concrete-sheathed g. i. conduits from the buried raceways.

Lighting transformers are 500-kva units with 4-wire secondaries. Grounding is through bare stranded 3/0 copper cables. Power transformers have 750- and 1000-kva ratings with 3-wire secondaries cross-connected through air circuit breakers. Substation equipment is compactly mounted in an arrangement which places the 440-volt transformers on one side and the 208/120-volt units plus all switchgear on the other side. Connections between the 440-volt transformers and their related control cubicles are established through short overhead runs of low-reactance busduct.

Power transformers serve nine parallel plug-in busduct runs, an air conditioning installation for the office area, seven dry-type 440/208/120-volt transformers for lighting in remote areas of the assembly plant, pull boxes for

*(Continued on page 150)*



**RECESSED PATTERN OF** lens bottom troffers is choice of George Magaw in his private office at Magaw Electric Co. Corner elements are 150-watt R-40 flood units with louvers. He carries planned lighting scheme to . . . .



**THE GENERAL OFFICE** with two complete systems. An incandescent silver-bowl indirect system produces 50 footcandles; the fluorescent, recessed, lens-bottom troffer system —45 footcandles. Both types can be used separately.

# They Practice What They Preach IN LIGHTING

**By Charles N. Laupp**

Superintendent, Wisconsin Electric Power Company  
Milwaukee, Wisconsin

It has often been said that electrical contractors are prone to neglect their own shops while making modern installations for customers. Such an accusation cannot be leveled at Milwaukee contractors engaged in planned lighting promotion. Many of them have the best in modern lighting. It began with those who felt that a prospective customer should be able to "ask the man who owns one." So they remodeled their offices to combine planned lighting with decorating; joined IES (40 percent of the NECA Chapter); set up enthusiastic lighting sales and engineering departments. Today, these contractors are living with planned lighting; inviting customers to visit and see for themselves; using employee reaction to advantage; selling good lighting with a firm conviction based on personal experience; and reaping the benefits, profitwise. Let's view a few of these shops and see what's been done.



**ESTIMATING ROOM** of A. C. Electric Co., has fluorescent troffers with semi-flush lens. President Orville Nichols works under 50 footcandles.



**NECA CHAPTER OFFICES** use silver-bowl, indirect, incandescent units. Manager E. H. Herzberg's private office has a comfortable 30 footcandles of light from these units and torchiers.



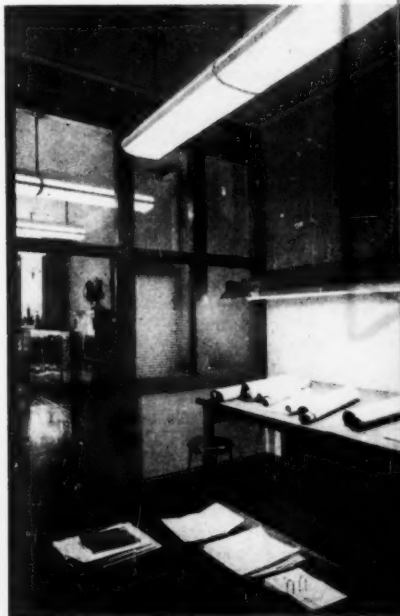
**IN HIS PRIVATE OFFICE**, George Andrae, Herman Andrae Electric Co., works under 52 footcandles from a louverall-type paneled ceiling while the . . . . .



**GENERAL OFFICE AND** reception area employees enjoy 45 footcandles of lighting from louvered bottom troffers. Alzak aluminum troffers provide 52 footcandles in estimating room.



**AT UHLEIN ELECTRIC** Company, Roy Dunst, president, used lens-bottom, suspended fluorescent units to get 50 footcandles in general office area, continued system in . . . . .



**ESTIMATOR'S PRIVATE OFFICE** for general lighting of same intensity, but supplemented this with localized lighting over estimating table to add another 100 footcandles on the boards.

# KNOW YOUR LABOR

**How Manpower Demand Curves can uncover conditions which vitally affect expended labor on electrical construction projects.**

**By Ray Ashley**

*Research and Consulting Engineer  
Chicago, Illinois*

**G**RAPHIC representation has become a universal medium of expression in the business world. Engineers show motor and machine performance data in the form of plotted curves. Management relies on this method to plot its production and sales progress. Over the years, electrical contractors have studied and developed curves of various types to guide them in the efficient operation of their business.

One of the most effective to the contractor is a set of Manpower Demand Curves. Such a management tool will show him the way to selection of the better jobs; reflect the effect of good and poor management on individual projects; and often explain profits and losses.

To get the full significance of the curves, generally it is necessary to plot the MPD (Man Power Demands) of several projects which overlap. Frequently the requirements of one job will affect the shape of a curve on others. Valleys and humps may be caused by shifting men back and forth to satisfy the temporary demands of other jobs. However, no attempt will be made to cover overall volume at this time. Attention will be confined to factors which influence individual projects.

## **Poor Management**

The curve in Fig. 1 shows the effect of poor management. The dotted line represents estimated labor demands, the solid line actual manpower used on a feed mill project. Estimated time was based on good management and close supervision of the work—a factor not realized on this particular job.

When the architect's representative called for men, the contractor was too busy to give the request his personal attention and decided to let the mechanics

get the work started. He would visit the job presently—a resolve that was constantly postponed. In the interim, everyone except the contractor took part in running the work.

Actually, the architect's representative insisted on having men on the job before they were needed. He also fussed and fumed whenever the contractor's foreman wanted to let any men go. During this time, other trades had electricians at their beck and call. As long as the electrical contractor gave the project no attention, his foreman was willing to let it drift along overmanned.

A "post mortem" analysis revealed that men were on the job two weeks before they were actually needed and most of the time the number of mechanics was double that required. The maximum number of men used was ten whereas six would have been sufficient.

The hump at the beginning of the Manpower Demand Curve in Fig. 1, shows what happens when one tries to "push" a job. An electrical construction project can go just so fast and any attempt to push it takes a toll in labor. It is better to have too few than too many men on a job.

The electrical contractor is always confronted with the problem of striking a balance between good service and economic business practice. He must try to keep architects, engineers, and buyers satisfied, but he cannot afford to cater to any whims which are costly from the standpoint of labor.

Anyone with authority on the job is likely to try to tell the contractor when, and how many men are needed. Unless the contractor visits the job site often enough, he is in no position to gracefully refute claims of others. There are times when a contractor must take a firm stand. He must run his own work.

Much has already been written about "Optimum Duration" (see *Electrical Estimating*, page 155, McGraw-Hill Book Co.) hence this discussion will be limited to a few comparisons. Data on an industrial project is shown in Fig. 2. Actual manpower demands are represented by the solid line curve. The optimum condition curve is plotted with a dotted line. In general, the actual demand curve compares favorably with the optimum curve. Duration periods coincide. Aside from the heavy peak demand, other variations are not too pronounced.

Because the manpower buildup shown by the solid line in Fig. 2 was gradual, it was not serious. The peak demand, however, was severe and indicated a serious condition because the job either had to draw heavily on other projects for men or recruit mechanics from the open market. The seriousness of the latter alternative depended upon the prevailing condition of the labor market.

The maximum demand for the project in Fig. 2 was 2.6 times the average demand. Actually, a healthy state exists on a job when maximum manpower demand approximates 1.75 times the average demand.

A dip in the curve, between the 17th and 18th weeks (75 and 85 days) was by no means good. It was the result of unexpected delays in material deliveries. The dissolution period (120 to 150 days) was a trifle abrupt, but not serious. If men are laid off too fast, other projects cannot absorb them.

On the whole, the project in Fig. 2 reflects good management and shows the opportunities of industrial work. Such projects generally provide enough work that can be carried on independently of other trades to enable the electrical contractor to maintain an even flow of labor.

## **Coordination**

Of course, there are types of industrial contracts which require much of the electrical work to be closely coordinated with that of other trades. Oil refineries are of this type.

A manpower demand curve for an oil refinery electrical project is shown in Fig. 3. Again, the curve does not depart too radically from the optimum curve. Had it not been for layoffs

# CURVES

due to procurement failures (materials not on job when needed) and holiday absences, the hump undoubtedly would have been appreciably reduced.

## Volume and Other Factors

Irregularities on one project may be caused by trying to satisfy the irregular demands of other jobs. Hence, it is frequently necessary to study, simultaneously, the manpower demand curves of several completed contracts. The greater the volume of work, the less likely that individual contracts will suffer from the fluctuating demands of others. To avoid the serious effects of varying labor demands, the electrical contractor must operate within his limitations.

The type of project, management of other trades, weather conditions, and numerous other factors may be reflected in the labor curves. Office buildings, sewage disposal plants, warehouses, and most other types of construction have their individual manpower requirements. Contractors are aware of this but may not appreciate the details of such requirements until they study the labor curves. The electrical contractor knows that management of the general contractor and other trades will affect his own labor requirements. Again, labor curves will indicate the seriousness of such influences.

In times such as these, when new architectural firms are springing up and established firms are over-expanding, it would be wise for the electrical contractor to carefully appraise the ability of any firm to which he plans to submit an estimate. Another factor is the speed with which plans are prepared. Drawings may be rushed to completion and contracts let. Once the work is started, mistakes crop up and progress is invariably retarded. Regardless of the type of formal contract or agreement, contractors find such projects costly. Foremen and key men are tied up with a consequent increase in overhead. Such influences show up on manpower demand curves as low, flat sections.

An existing project, with which the author is familiar, is a good example. It is dragging along due to a change in design of steel columns. The work

(Continued on page 152)

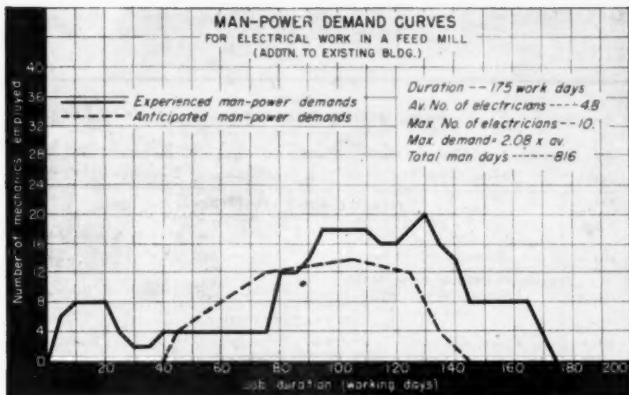


FIG. 1—Job neglect is indicated by these manpower curves on a feed mill electrical project. Note the striking difference between estimated job duration and actual man-hours expended; also the excessive peaks.

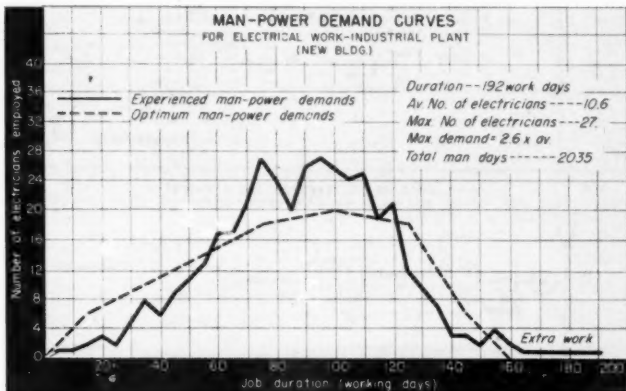


FIG. 2—Severe peak demands show up on this manpower demand curve for an industrial plant project. Peak demands should approximate 1.75 times average demands.

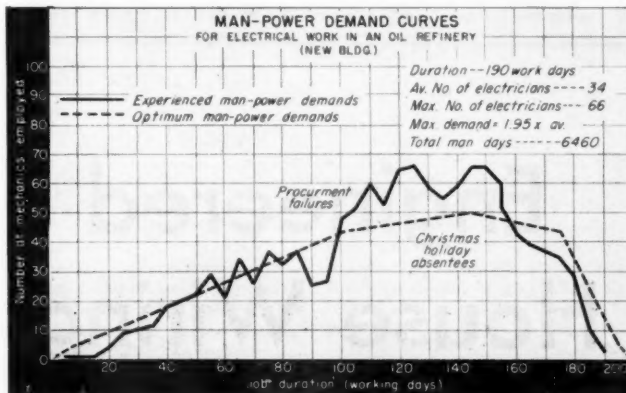


FIG. 3—Good management is reflected in this oil refinery project. Excepting dips and peaks due to procurement failures and holiday absences, labor curve closely approximated estimated optimum demand curve.



SHEET No. 1

## HOME WIRING ESTIMATOR

JOB NO. 20-  
DATE July 1, 1951

JOB LOCATION 325 Walnut Street

OWNER John Doonan BUILDER Homesat Builders, Inc.

Ref. to 1951 NEC

### BRANCH CIRCUIT REQUIREMENTS

(SEE WESTINGHOUSE HOME WIRING HANDBOOK, CHAPTER IV)

A. GENERAL LIGHTING LOAD  
2116-a-1 2000 Sq. Ft. x 3 Watts ..... 6000 Watts

B. MINIMUM NUMBER OF BRANCH CIRCUITS

2115-a ✓ General Purpose 6000 Watts x 115 Volts = 52 Amperes  
which means (4 - 15 amp. 2 wire or ) ..... 3 - 1 pole  
( 3 - 20 amp. 2 wire circuits )

2115-b ✓ Small Appliance\* 2 - 20 amp. 2 wire circuits ..... 2 - 1 pole

2115-c  
2121-c-1 ✓ Individual Equipment

<input checked="" type="checkbox"/> Range	50 amp. 3 wire 115/230 volts	1 - 2 pole
<input checked="" type="checkbox"/> Water Heater	20 amp. 2 wire 230 volts	1 - 2 pole
<input checked="" type="checkbox"/> Laundromat* Clothes Washer	20 amp. 2 wire 115 volts	1 - 1 pole
<input checked="" type="checkbox"/> Clothes Dryer	10 amp. 2 wire 115/230 volts, or )	1 - 2 pole
<input type="checkbox"/> Dishwasher**	20 amp. 2 wire 115 volts	1 pole
<input type="checkbox"/> Food Waste Disposer**	20 amp. 2 wire 115 volts	1 pole
<input type="checkbox"/> Attic Fan	20 amp. 2 wire 115 volts	1 pole
<input type="checkbox"/> Bathroom Heater No. 1	20 amp. 2 wire 115 volts	1 - 1 pole
<input type="checkbox"/> Bathroom Heater No. 2	20 amp. 2 wire 115 volts	1 pole
<input checked="" type="checkbox"/> Heating Plant - Precipitation*	20 amp. 2 wire 115 volts	1 - 1 pole
<input type="checkbox"/> Electric Home Heating	1 amp. 2 wire 115 volts	1 pole
<input checked="" type="checkbox"/> Power Law	20 amp. 2 wire 115 volts	1 - 1 pole
<input type="checkbox"/>	amp. wire volts	pole
<input type="checkbox"/>	amp. wire volts	pole
<input type="checkbox"/>	amp. wire volts	pole

Total Circuits 12  
Total Poles 15

### LAYOUT OF LOADCENTERS AND FEEDERS

(SEE WESTINGHOUSE HOME WIRING HANDBOOK, CHAPTER V)

\* NEC minimum..... 1 Circuit  
For more adequate service..... 2 Circuits  
Recommended for "Electrical Living"..... 3 Circuits

\*\* Where dishwasher and food waste disposer are combined in an electric sink unit, one 20 amp. circuit will serve both units.

SHEET No. 2

## CALCULATION

(SEE WESTINGHOUSE HOME WIRING HANDBOOK, CHAPTER IV)

Ref. to 1951 NEC

A. GENERAL LIGHTING LOAD (transfer from 2203-c-1)

B. SMALL APPLIANCE LOAD .. 2 circ

2203-a

C. INDIVIDUAL EQUIPMENT LOAD

2203-d

<input checked="" type="checkbox"/> Range	.....
<input checked="" type="checkbox"/> Water Heater*	.....
<input checked="" type="checkbox"/> Laundromat* Clothes Washer	.....
<input checked="" type="checkbox"/> Clothes Dryer	.....
<input type="checkbox"/> Dishwasher	.....
<input type="checkbox"/> Food Waste Disposer	.....
<input type="checkbox"/> Attic Fan	.....
<input checked="" type="checkbox"/> Bathroom Heater No. 1	.....
<input checked="" type="checkbox"/> Bathroom Heater No. 2	.....
<input checked="" type="checkbox"/> Heating Plant - Precipitation*	.....
<input checked="" type="checkbox"/> Electric Home Heater**	.....
<input checked="" type="checkbox"/> Power Law	.....
<input type="checkbox"/>	.....
<input type="checkbox"/>	.....

Total

2203-e

D. SERVICE EQUIPMENT AND SERVICE-ENTRANCE

For 115/230 volt, 3 wire system

2304-a Service-Entrance Conductors

2351-a Main Breaker

2357

WHERE WATER HEATER IS ON SEPARATE W D-1 Service Equipment and Feeder

For 230 volt, 2 wire service Feeder size

Main Breaker

\*\* WHERE ELECTRIC HOME HEATING IS ON A D-2 Service Equipment and Feeder

Total Load in watts

For 230 volt, 2 wire service Feeder size

Main Breaker

# Engineered House Wiring

Layout forms simplify calculations, assist Code compliance and design adequacy

GOOD wiring design for residential loads takes careful layout and calculation. A number of references to standards are necessary for Code compliance as well as for adequacy. Carl Breßahl, Westinghouse Better Homes Bureau, has worked out a standard form which systematically sets up the essential design data and greatly simplifies procedure.

By following through four pages of the "Home Wiring Estimator" the user painlessly sets up the branch circuit requirements by filling in blanks and marking a check list. He then sketches

# OF TOTAL LOAD

(SEE HANDBOOK, CHAPTERS V AND VI)

	Connected Load	Demand Load
"A", Sheet No. 13.....	6000	
costs x 1500 watts.....	3000	
<b>Total</b>	<b>9000</b>	
First 3000 watts at 100%		3000
Balance 6000 watts at 35%		2100
	12,000	8,000
350 watts		
4500 watts		
1500 watts		
760 watts		
800 watts		
7610 watts at 75%	7610	5700
<b>Total</b>	<b>28,610</b>	<b>18,800</b>

SEE CONDUCTORS  
 8,800 watts ÷ 230 = 38.2 amp.  
 3 conductors No. 2  
 90 amp. 2 pole

TER:  
 3500 watts ÷ 230 = 15.2 amp.  
 2 conductors No. 10  
 30 amp. 2 pole

SEPARATE METER:  
 1000 watts ÷ 230 = 4.3 amp.  
 2 conductors No. 10  
 20 amp. 2 pole

**TOTAL** 32,110 21,300

SHEET No. 3

# CALCULATION OF FEEDERS TO LOADCENTERS

(SEE WESTINGHOUSE HOME WIRING HANDBOOK, CHAPTER VI)

## FEEDER TO LOADCENTER NO. 1

Ref. to 1951 NEC			
2203-a	A. GENERAL LIGHTING LOAD: _____ Sq. Ft. x 3 watts = _____ watts		
2203-c-1	B. SMALL APPLIANCE LOAD: _____ = _____ watts		
	Total _____ watts		
	First 3000 watts at 100% _____ watts		
	Next _____ watts at 35% _____ watts		
2203-d	C. INDIVIDUAL EQUIPMENT LOAD:		
	Range _____ 350 watts		
	Clothes Dryer _____ 4500 watts		
	Refrigerator _____ 1500 watts		
	Heating Plant and Pump _____ 500 watts		
	Power Saw _____ 500 watts		
2203-e	Total _____ watts at 75% = _____ watts		
	Total _____ watts		
2201	D. FEEDER SIZE: For 115/230 volt, 3 wire system _____ watts ÷ 230 V. = _____ amp. = No. _____ Wire		
2202	E. VOLTAGE DROP: Cir. Mil. = $22 \times 72 \text{ amp} \times 75 \text{ ft.} \div 2.3 = 23,000$ = No. _____ Wire		

## FEEDER TO LOADCENTER NO. 2

2203-a	A. GENERAL LIGHTING LOAD: 2,000 Sq. Ft. x 3 watts = 6,000 watts
2203-c-1	B. SMALL APPLIANCE LOAD: _____ = _____ watts
	Total _____ watts
	First 3000 watts at 100% 3,000 watts
	Next 4500 watts at 35% 1,575 watts
2203-e	C. INDIVIDUAL EQUIPMENT LOAD:
	_____ watts
	_____ watts
	_____ watts
	_____ watts
	_____ watts
2203-e	Total _____ watts at 75% = _____ watts
	Total 4,575 watts
2201	D. FEEDER SIZE: For 115/230 volt, 3 wire system 4,575 watts ÷ 230 V. = 19.8 amp. = No. 10 Wire
2202	E. VOLTAGE DROP: Cir. Mil. = $22 \times 20 \text{ amp} \times 50 \text{ ft.} \div 2.3 = 9,600$ = No. 10 Wire

a rough riser diagram or feeder layout. On the next sheet the usually complicated demand calculation is again a simple matter of filling in blanks and carrying out the indicated arithmetic to wind up with connected load, demand load, service conductor size and main overcurrent protection. Additional forms on page three provide for the same precise calculations of feeder sizes to load centers and the fourth page provides a cross index of each type of outlet and the number in each location. A detachable stub lists the cost record for estimating. Since

Code factors and constants are given in the forms about the only additional reference needed is the wire carrying capacity table and appliance wattage data. While the step-by-step procedure is very easy to follow the forms are in no sense a rule of thumb or short cut. The resulting data is precise and conforms strictly with Code requirements and sound engineering practice. 1951 Code article references are given for each step. The forms can be used by the contractor not only in laying out the work,

but as a part of the specifications, with the wiring proposal, as a reminder check-list in laying out work with the owner or builder or as a job record. Some will see in it a very useful sales tool since the check-lists not only indicate what appliances are provided for, but would show up those for which no provisions are made. According to the Westinghouse Better Homes Bureau, the work sheets, including those illustrated, measuring 11 by 17½ inches, will be available to electrical contractors through trade channels at moderate cost.

# Sales Management for an Electrical Contracting Business

**PART 2—** A look at lighting sales department organization plus a review of sales tools which an electrical contractor can effectively use to promote his overall operation.

## Lighting Department Budget

Data for this budget for material and labor costs were taken from Accounting reports from previous years. Overhead costs are those actually anticipated. These statistics, together with the anticipated sales volume for the year constitute the basic figures.

### Budget:

Material Cost	\$46,922	51% of Sales
Labor Cost	15,600	17% "
(6200 Hours — 3 men)		
Commissions	5,900	6.5% "
Job Expense	3,032	4.5% "
Prime Cost	\$71,454	79% "
Dep't Overhead	5,900	7% "
Burden on Labor	5,153	5% "
	\$82,507	
Return	8,090	9% "
Total Sales	\$90,597	

### Labor Pricing:

Cost per Hour	\$2.50
Payroll Tax	.14
Burden	1.00
	\$3.64
Return	.26
Selling Price	\$3.90 per hr.

### Material Pricing:

Cost	\$46,922
Total Anticipated Return	\$8,090
Return from Labor	
6200 hrs. @ .26 per hr.	1,612
	\$6,478

Divide \$6,478 by \$46,922 to obtain a percentage adder of 13.8 percent. Thus, all Labor will be sold at \$3.90 per hour, and all material will be sold at Cost plus 13.8 percent.

Commissions are varied in accordance with a Commission Chart.

Percent adder for Dep't Overhead is added in the same percentage as shown on the Commission Chart.

Lighting Salesmen can also be setup under a profit sharing program.

**By Ralph E. Johnson**

Vice President and General Manager  
Sturgeon Electric Company, Inc.,  
Denver, Colorado

**P**ROBABLY no greater sales opportunity faces the electrical construction industry than that offered by the lighting field. Regardless of what phase you investigate—industrial, commercial or residential—there is need for more adequate lighting facilities. During World War II and the postwar period, experience proved that good, planned lighting played an important role in developing more production, better workmanship and higher employee efficiency. Add to this the protective lighting so necessary at times like the present and you have a fairly broad field of operation.

For an electrical contractor already in—or contemplating entering—this field, it is good business practice for him to departmentalize his lighting sales force and man it with highly trained, technical sales personnel.

While it is not necessary for a lighting salesman to be a specialist in electrical estimating, wiring or construction, it helps considerably if he and his associates have a working knowledge of these fields. The more proficient he becomes, the greater his opportunities because all these phases of the business are so closely related.

One very workable combination is to assign an electrical construction engineer to work with three or more lighting salesmen to handle their wiring and construction estimating and other details. If men with proper

**FIG. 6—**Lighting department budget is developed from cost accounting reports of previous years; establishes an operating picture and sales potential.

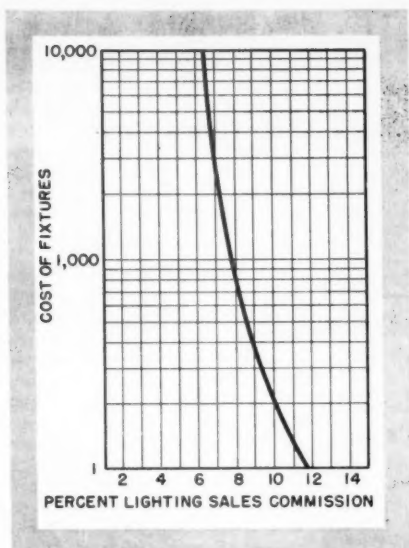


FIG. 7—Sales commission curve is the basis for added compensation for lighting department salesmen.

technical background are employed, the contractor will find the lamp and fixture manufacturers most cooperative in helping him give these men the necessary training.

A budget and pricing structure for our lighting sales department has been worked out in Fig. 6. As indicated here, lighting salesmen have the added incentive of commissions varying according to the curve shown in Fig. 7, plus the chance to participate in a profit sharing program in direct proportion to their annual sales records.

#### Motor Shop and Equipment Sales

The Motor Shop generally has been recognized by the industry as a specialized phase apart from the electrical contracting business (largely because of labor differences). Nevertheless it is a field which would not only offer splendid sales opportunities, but also be an excellent adjunct and stabilizer to electrical installation work.

This field easily could be recognized as the *power* phase of the lighting and power installation business, in addition to offering a great outlet for the sale of equipment. Thus the motor shop offers the contractor an entry into the industrial business.

Because it is highly specialized in nature, it is extremely advisable to departmentalize motor repair work. At the same time, it could be used as an adjunctive feeder to the Service De-

#### Motor Shop Budget

In effort to determine how much business would be required to sustain a Motor Shop on a profitable basis, it was first established that the fixed Overhead of the shop would be \$1916.00 per month.

Statistical data from similar operations showed that the average Overhead as a Percent of Sales is about 25 percent.

Therefore the Volume of Anticipated Sales would be \$7,666 per month or \$92,000 per year.

Percentages for material, labor, and job expenses were taken as follows:

	Percent of Sales	
Material Cost	38	\$34,960
Labor Cost	29	26,680
Job Expense	4	3,680
	71	65,320
Overhead	25	23,000
		88,320
Return	4	3,680
		92,000

At prevailing Labor rates, this volume of business would require 7 productive shopmen.

FIG. 8—Motor shop budget established to determine sales needed to make such a department operate on a profitable basis.

FIG. 9—Typical advertisement run in the local paper. Such a program is gaining recognition for Sturgeon Electric Company.

## STURGEON ELECTRIC COMPANY, INC.

## Comparative Budget Report

Department No. II				Month		May		1950	
Item	Actual This Month	%	Budget This Month	%	Actual Year to Date	%	Budget Year to Date	%	
MATERIAL	1,747.00	24.2	2,699.00	29.0	1,747.00	24.2	2,699.00	29.0	
LABOR	3,105.00	43.0	3,500.00	38.0	3,105.00	43.0	3,500.00	38.0	
JOB EXPENSE	149.00	2.1	246.00	2.7	149.00	2.1	246.00	2.7	
PERMITS & MISC	193.00	2.6	120.00	1.3	193.00	2.6	120.00	1.3	
PRIME COST	5,194.00	71.9	6,525.00	71.0	5,194.00	71.9	6,525.00	71.0	
OVERHEAD	1,385.00	19.2	1,741.00	19.0	1,385.00	19.2	1,741.00	19.0	
RETURN	648.00	8.9	900.00	10.0	648.00	8.9	900.00	10.0	
SALES	7,227.00	100.0	9,166.00	100.0	7,227.00	100.0	9,166.00	100.0	
RATIO:									
ACTUAL SALES TO BUDGET . . . . . THIS MONTH 78.8 %									
YEAR TO DATE 78.8 %									
Signed <i>JS</i>									

FIG. 10—Comparative budget report for each department gives management a monthly cost picture of the operation. Anticipated costs are established before fiscal year begins. Actual costs are listed monthly.

partment. With this combination backed up by adequate technical sales assistance, the possibilities are tremendous. A possible budget determination for a motor repair unit of an established electrical construction operation is shown in Fig. 8.

#### Appliance Sales and Service

Like the motor shop, this is a highly specialized merchandising field and should similarly be departmentalized and developed along specialized lines.

In addition to offering fine sales opportunities, this department would serve as an excellent feeder for small installation business for the Service Department. Appliance service and repair would also stabilize the Shop repairman's work, and thus convert what might be an overhead expense into a direct charge item.

#### Public Relations and Advertising

Probably one of the most prominent stabilizing factors in any business is Public Relations. This is an intangible factor which defines the attitude and acceptance on the part of the consuming public for the services of a business.

This important business medium is most widely stimulated by an aggressive sales program, and responds most pronouncedly to services which are required in the every day standard of living. The use of electricity has become such a service in every walk of

life. Yet, for the electrical contractor who is engaged in competitive installation work alone, it is quite difficult to carry on an effective public relations program. For this alone, every business must develop an aggressive sales program of some kind, and build its public acceptance.

A most important tool of Sales Management is an effective advertising program. This is equivalent to much aggressive sales action. The possibilities in the electrical contracting business for the proper use of this medium are unlimited. Like all other business activities however, it must be right to get results. And a reasonable budget (some use  $\frac{1}{2}$  of 1% of total sales) should be established for such a program.

The success of any type of advertising seems to lie in its repetitive, continuous application. Everyone uses electrical installation work to a more or less degree, but for the most part they create their own desire. Therefore, advertising must indelibly imprint the source of supply upon the minds of the consumers so that when they are ready for the service, they automatically think of but one source.

Three principal attributes of a successful advertisement apply to the products of our industry, namely:

1. The advertisement must attract attention.
2. It must cause the reader to completely read it.

3. It must sell something specific, and cause the reader to act.

The advertising of electrical installation work, if presented in such a manner that these three principles are embodied in it, can create a demand on the part of the consumer. Without any one of these factors, the advertisement will not be a successful sales medium. Fig. 9 shows typical ads of our firm in the local press.

#### Market Research

Not all communities offer the same sales opportunities to the same degree. Areas which are highly industrialized offer sales media which differ from those of a tourist of recreational nature. As a result the business pattern which is adopted must conform to the opportunities offered. The only means of determining the pattern is by Market Research.

Market Research provides the means for stability of employment and continuous business operation as well as the achievement of a successful sales program. The more diversified the business, the greater the possibilities for stability.

#### Budgeting Determines Price

The foundation of all pricing determinations is budgeting. It is here that Sales Management must coordinate its activities with those of the Controller to develop a pricing policy consistent with good business practice, enable him to market a competitive product, and still provide a reasonable economic return to the business.

The first step in determining the necessary margins for establishing selling prices, is that of preparing a budget of anticipated costs of doing business in advance of the business year. Schedules of operating costs for each department are set up as shown in the monthly Comparative Budget Report in Fig. 10.

Overhead costs can be accurately determined, but Labor, Material, and Job Expenses must be arrived at from statistical data of previous years.

Although the primary interest of general management lies in the overall business picture, Sales Management is principally concerned with the departmental breakdown—from which standpoint sales quotas can be established and pricing schedules determined.

Methods of Sales Compensation determine largely the incentive which will be supplied toward making sales quotas.

There are three principal types of sales compensation, namely:

(Continued on page 154)



# ELECTRICAL CONTRACTORS!

sign on SYLVANIA and watch sales

**SOAR**

## 3 Complete Direct Mail Campaigns win more business...in every field!

Scores of Electrical Contractors are already benefiting by this great Sylvania ad program. Don't you miss it!

It's bound to bring lighting, wiring and fixture business to your door because it's personalized, powerful, and complete. First you get colorful new emblems to identify you with the campaign. Next, 3 separate direct mail campaigns, imprinted with your name and address, are sent out by Sylvania to your own lists of prospects.

### Backed by page ads in National Magazines

Full-page ads in *Time*, *Business Week*, *Newsweek*, and other important publications display your Qualified Lighting Contractor emblem and tell readers about the expert service you offer.

### ...and tied into a popular TV show!

The big CBS-TV Show, "Beat the Clock" also features your new emblem. But, there's much more to it than this brief space permits us to tell. For full details mail the coupon NOW!

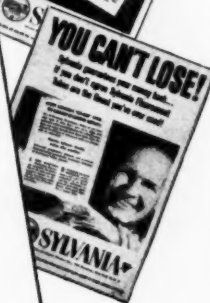
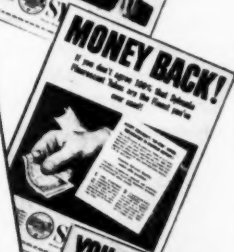
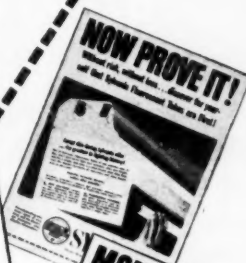


This emblem on your trucks, windows, and stationery identifies you as the Qualified Lighting Contractor in your community.



# SYLVANIA

FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS



Sylvania Electric Products Inc.  
Dept. L-6112, 1740 Broadway, New York 19, N. Y.  
Please let me have full details about Sylvania's  
FREE business-getting campaign for Electrical  
Contractors.

Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

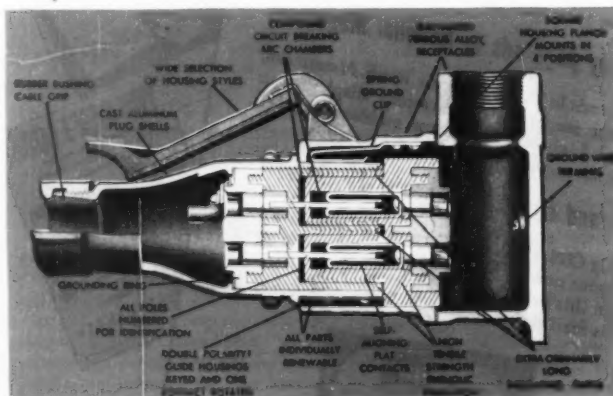
SAFE • DURABLE • DEPENDABLE

PLYE-NATIONAL

# Heavy Duty Plugs and Receptacles

## FOR PORTABLE ELECTRICAL EQUIPMENT

Pyle-National plugs and receptacles are built to withstand the most severe operating conditions, as proven by years of remarkably dependable service in a wide variety of industrial applications. The many substantial construction features of this extensive line of plugs and receptacles and the high quality of materials and workmanship insure safe operation, uninterrupted service and long life. \*



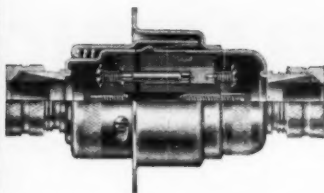
**QuelArc\* • Circuit Breaking Series** Unique partitioned insulation provides long insulated paths through air and across surfaces for exceptional protection in these current rupturing devices. Cast metal housings, high grade insulation and individually renewable contacts insure long service life. Ratings 20, 30, 60, 100 and 200 amperes, 250 volts DC, 600 volts AC—2, 3, and 4 pole—grounded through shell or extra pole. Threaded cap, plain and hinged spring door housing styles are available.

\*TRADEMARK REG. U. S. PAT. OFF.

## THE PYLE-NATIONAL COMPANY

1344 NORTH KOSTNER AVENUE, CHICAGO 51, ILLINOIS  
BRANCH OFFICES AND AGENTS in principal cities of the United States and Canada. • EXPORT DEPARTMENT:  
International Rail Supply Co., 30 Church St., New York. • CANADIAN AGENT: The Holden Co., Ltd., Montreal

CONDUIT FITTINGS • FLOODLIGHTS • TURBO-GENERATORS • GYRALITES • MULTI-VENT AIR DISTRIBUTION



Interchangeable reversible contact units.  
1, 2, 3, 4, 6, 8 pole



## Triploc\* and Multiple-Circuit Series

A line of exceptional versatility, unequalled in the heavy duty field, with a virtually unlimited number of assembly combinations for varied applications. Offers a selection of 1, 2, 3, 4, 6 and 8 pole contact units which are interchangeable and reversible in any single set of housings. Many types of housings available of pressed steel with automatic lock and of cast metal threaded for watertight gasket seal. Multi-Circuit housings with 2, 3 and 4 contact units available for combinations up to 32 poles. Ratings 15 and 20 amperes, 250 volts DC, 460 volts AC—circuit breaking. Pressed steel fusible and fuseless plugs measure only 1 1/8" outside diameter.

## Midget Triploc\* Series

Same construction features as Triploc except for much smaller outside diameter of plug shell—only 1 1/4". Interchangeable and reversible contact units—2, 3 and 4 pole—are of the flat blade type. Rated 10 amperes, 250 volts; 15 amperes, 125 volts.



**General Purpose Series** Available with cast metal housings in many types for circuit breaking and disconnect service. 30 amperes, 125 volts DC, 250 volt AC—1, 2, 3, 4, 5 and 6 pole. 60 amperes, 250 and 600 volts—3, 4 and 5 pole. 100 ampere, 250 and 600 volts—2, 3 and 4 pole. Also many special types, fusible and fuseless, for varied applications.



# Our Defense Program Faces a Crisis

---

**A major crisis will soon confront our defense program.**

**It is not a crisis in raw materials.** To find enough materials, from steel to cobalt, for defense production is a serious problem. But it is one that is being solved.

**It is not a crisis in manpower.** Shortages of workers with special skills hamper production, but these shortages are being relieved, slowly.

**It is not a crisis in manufacturing capacity.** American industry's record-breaking expansion is, with very few exceptions, keeping abreast of defense needs.

**The coming crisis will be one of finance.** It will rise from our failure to provide the means to PAY FOR the defense program we now have under way.

## **A \$15 Billion Deficit?**

Congress has approved a defense program which is scheduled to raise *total* federal spending in the year from June, 1952, to June, 1953, to somewhere between \$85 and \$90 billion. Additional appropriations for more air power and atomic development, which are now proposed, would add several billion dollars.

But Congress has not approved a tax plan to match such spending. With the new levies

enacted in this session, tax collections during the 1952-53 fiscal year are estimated to fall somewhere between \$70 and \$75 billion. That would be roughly \$15 billion short of balancing the budget. If the defense program is expanded, the deficit will be that much greater.

We have not yet felt the impact of the crisis that would accompany a federal deficit of this magnitude. Federal tax collections currently are big enough to balance federal expenditures. But the defense program is scheduled to boost the annual rate of federal expenditures \$25 billion in the next year.

## **To Meet the Crisis**

By January the crisis will be clearly in sight.

Then the President will present his budget. After that, Congress must act to close the broad gap between government income and government spending. If it fails to do that, the whole defense program will be menaced by weakness in its financial foundations. That weakness might well take the form of another destructive wave of inflation.

## **We have three ways to meet this crisis.**

The best approach, of course, is to cut unessential expenditures. That can make a real dent in the deficit. The second is to collect more

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taxes. The third, and by all odds the most dangerous, is to have the federal government meet its deficit by going deeper into debt. Borrowing, which might feed inflation, can easily lead to disaster.

### **Near Income Tax Limits**

It will not be possible to raise taxes to meet the deficit merely by increasing further the rates on corporations and on persons in the upper income brackets. Congress has about scraped the bottom of that barrel.

The Senate Finance Committee said as much in reporting this year's tax bill. The Committee reported that it had "serious doubts as to the feasibility of raising any substantial additional amounts of revenue from income tax sources." The Committee observed that recent tax legislation brings the burdens of most corporate and individual income taxpayers close to the World War II peaks, and actually carries the rates paid by many taxpayers above those peaks.

Our ramshackle federal tax system must be thoroughly overhauled in order to broaden the tax base if it is to produce more revenue—without doing much more harm than good.

**The shocking fact is that no one seems ready to act along any line that might enable us to surmount the crisis.**

That fact of itself aggravates the coming crisis. And next year's presidential election doesn't make it any easier to move effectively. Both parties will shrink even more than normally from backing any program that might irritate any considerable number of voters.

If we are to meet this crisis on the tax front in an orderly way, the technical work should

be in progress right now. To a large extent it is being ignored.

If we are to enforce the vitally essential program of government economy, there is the same urgent need to get under way the spade work that is required.

And if—as a last miserable expedient—we decide to let the federal government drift deeper into debt, it must have a well-developed program of borrowing from individuals and other investors, such as insurance companies, rather than from the commercial banks. Borrowing from commercial banks might speedily translate the deficit into more and more price inflation. No adequate program of borrowing from savings is now in sight.

### **Now Is the Time**

It is possible, of course, that international relations may improve sufficiently to make it safe for us to slow down the rearmament program. If that should happen, the fiscal crisis would not be so critical. But that kind of good fortune has been notably absent in recent years.

**Lenin, patron saint of Communism, is quoted to the effect that to destroy a political and social system such as ours "you must debauch its money."**

We shall set democracy to digging its own grave if, through our preoccupation with politics during the presidential campaign, we pave the way for further debauchery of our money.

If we really want to avert that disaster, now is the time for us to get going.

Once the crisis is full upon us, it will be too late.

**McGraw-Hill Publishing Company, Inc.**

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#### "MAN-MADE DAYLIGHT"

These fixtures in Otis Elevator Company's New York offices are "PBM" luminous direct-indirect units manufactured by Day-Brite Lighting, Inc., St. Louis, Mo. They consist of fluorescent tubes totally enclosed in PLEXIGLAS cylinders. White translucent bottom sections diffuse light downward and permit it to be reflected from ceiling. Fully enclosed design protects light sources from dust accumulation—insures long-time maintenance of high lighting level with occasional easy cleaning. Distributor: Graybar Electric Co., New York City; Electrical Contractor: H. C. Ruschmeyer & Son, New York City; Architect: Carl J. Kroepel, New York City.



## PLEXIGLAS Lighting...

### Cuts Shadows without Substituting Glare

When shadows get caught on the point of a draftsman's pencil—or glare gets in his eyes—plans are bound to suffer. Otis Elevator Company ended these frequent drafting-room annoyances with a new type of PLEXIGLAS lighting fixture. Now there's no trouble with shadows or glare on the drafting tables.

In offices, plants, schools, public buildings, and homes, white translucent PLEXIGLAS leads

to good lighting. It gives high level illumination with low source brightness. Result:—Full, pleasant lighting that lets you see without eyestrain.

PLEXIGLAS is easy to erect and maintain, in luminous ceiling installations, coffer lighting, and individual fixtures. Light weight and shatter-resistance mean safety overhead, and low-cost maintenance in the bargain. Full information on PLEXIGLAS acrylic plastic for lighting is yours without obligation.

CHEMICALS



FOR INDUSTRY

PLEXIGLAS is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.

Canadian Distributor: Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.

**ROHM & HAAS  
COMPANY**

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

*Representatives in principal foreign countries*



# Contractors hail BullDog

TEXAS 4-2900

Established 1906

W. D. GALE, INC.

*Electrical Contractors*

7145 Tireman Avenue  
DETROIT 4, MICH.

October 29, 1951

BullDog Electric Products Company  
P. O. Box 177  
Detroit 32, Michigan

Gentlemen:

Well, someone finally did something about it!

Congratulations, gentlemen, for clearing up the safety switch end of the complex electrical-products field. As one of Detroit's oldest contractors we are already feeling the effects of your simplified Vacu-Break line.

For example, to insure installations on time, we have always had the problems of stocking a heavy, complicated inventory of electrical materials, among them many of the 206 safety switches you formerly catalogued. Now that you have reduced that line to only 38 for all applications, ordering is easier, and we have been able to cut our switch inventory drastically.

This, of course, means we can keep our investment down, and save on sorely needed warehouse space, as well.

Furthermore, our customers like your program -- since they receive Type A switches at Type C prices -- improved quality at less cost to them.

Thanks for taking the confusion out of the safety switch line and for initiating a sensible program which should benefit the entire industry.

Very truly yours,

W. D. GALE, INC.

*J. A. Schoenith*  
J. A. Schoenith,  
President



**THINK OF IT!** Only 38 great, new Type A safety switches now replace hundreds... fill all your A, C, D requirements... make ordering, handling, installing an easier job!

# simplification plan

*Report savings in time, money by stocking and installing new*

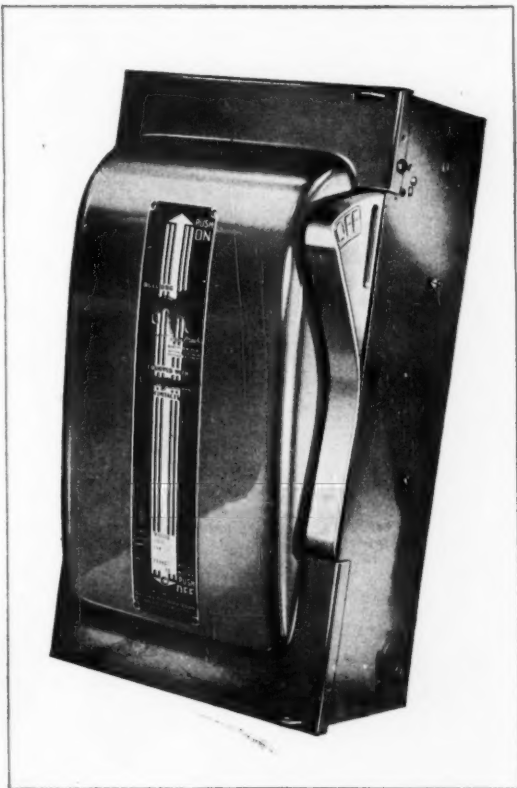
## VACU-BREAK MASTER SAFETY SWITCHES

In enthusiastic letters like that at the left, contractors everywhere applaud the new BullDog simplification plan . . . report new-found convenience, slashed costs, easier installations with the great Vacu-Break Master Safety Switch line.

Why not look into this revolutionary switch line yourself? Its high quality, medium price and versatility may well be the answer to many of your safety switch problems, too.

Write Dept. 453-B for descriptive folder.

**A TYPE A SWITCH  
AT TYPE C PRICES!**



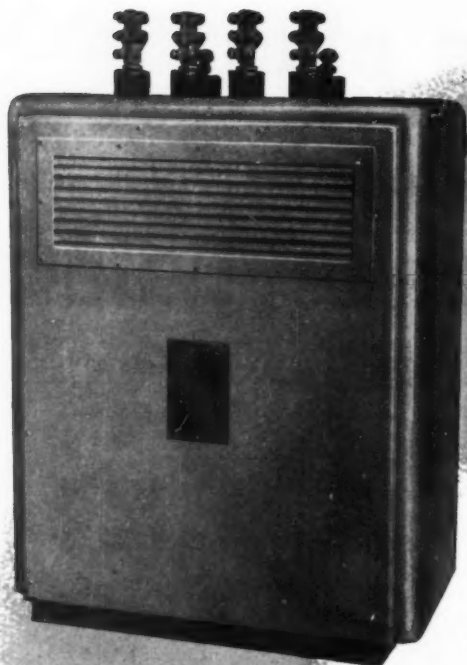
# BULLDOG

**BULLDOG ELECTRIC PRODUCTS COMPANY**

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

**THE LEADER IN FLEXIBLE ELECTRICAL DISTRIBUTION**



## MORE KVA PER POUND!

Lightweight, dry-type transformers save space, cut installation costs. 3 through 167 kva, single phase, or 9 through 225 kva, three phase.

They're lighter and smaller! Compact, completely ventilated coils on Hipersil® cores—neatly enclosed in sheet steel cases for convenience of mounting, cleanliness, trim appearance.

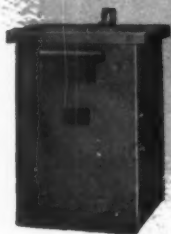
Add all this to the savings inherent in dry-type transformer design:

**NO VAULTS.** Mount them on the floor, walls, posts or overhead platforms, close to the load they serve. They're safe.

**SIMPLIFIED MAINTENANCE.** No liquids to store, filter or replace. No gauges, radiators, valves or gaskets to get out of order.

Westinghouse Dry-Type Transformers are available for voltage step-down or step-up applications or for phase changing. Types AJRB and AVRB (3 through 100 kva) have circuit breakers built into the high-voltage circuit, giving 3-way protection against damaging overloads or short circuits, cutting installation time up to 50%. Ask your Westinghouse representative for a copy of B-4428, or write Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Pennsylvania.

J-70607



YOU CAN BE SURE... IF IT'S  
**Westinghouse**



**DRY-TYPE  
TRANSFORMERS**

# Motor Shops



**CHIP TROUGH ON** wheels can be moved from lathe to scrap barrel. Because chore is easy, troughs are emptied frequently and floor area is kept clean.

## Portable Chip Trough Helps Keep Shop Clean

Motor shops are normally one of the toughest places to keep clean what with dirt and grime on motors, stripped insulation, varnish and paint, and odd and sundry metal filings and chips. It takes a rugged set of housekeeping rules and diligent administration of same to keep such an area in a presentable condition.

Evidence that this can be done shows up at the motor repair division of the Armature and Electric Machine Company in Omaha, Nebraska. One of the basic reasons is that management makes it easy for the employees to keep the shop area clean.

A special preparation on the hardwood floor makes it easy to sweep. Machinery is painted an attractive orange-yellow color which shows up grease and dirt quickly and invites the dusting cloth. And numerous other small items take the drudgery out of the clean-up chore.

Outstanding example of this is the portable chip troughs designed for use under the two metal-cutting lathes in the shop. The rectangular wood trough is mounted on four sturdy legs, two of which are equipped with large casters. A large sweeping handle, fashioned from a length of conduit, is mounted to the trough sides near the

front legs; is held in horizontal position by two bolt extensions; drops down when released.

The troughs fit snugly under the lathe beds and prevent chips from spattering out over the floor. They can be easily pulled out and pushed over, wheelbarrow fashion, to the large chip barrel for quick emptying. If an abundance of cutting lubricant is used, the wood troughs can be lined with sheet metal.

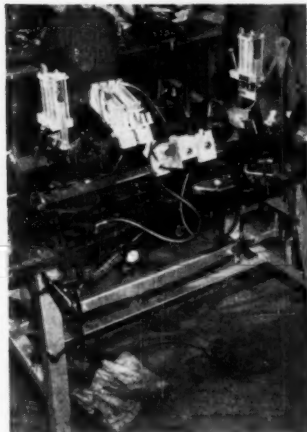
Net result: chip troughs are emptied more frequently and chances of spill-over on the floor are negligible.

## Air Cylinders Operate Coil Spreader

The conventional coil spreader found in most motor repair shops is the standard model operated by a foot pedal connected by mechanical levers to the spreading arms. Equipment of this type does a good job but may tax the strength of the operator when coils are produced in large quantities. Fatigue-induced relaxation of the operator may result in a lack of uniformity of coils in a given set which eventually will require more time to insert in stator or armature slots. Also, it is difficult to use inexperienced help on such equipment—a considera-

tion which takes on increased importance in the present day shortage of skilled labor.

This was the feeling in the shop of the Willey-Wray Electric Company in Cincinnati, Ohio. So they converted a foot-operated coil spreader to a semi-automatic operation by installing a group of air cylinders, more or less as an experiment. It has proved so successful that accurately dimen-



**CONVERTED TO AIR** operation is this conventional foot-operated coil spreader. Eight air cylinders are used (two are hidden under table). Foot pedal and two levers control air valves.



**HAIRPIN COIL** is placed over interlocked stationary fingers of four cylinders on spreading arms. Cylinders can be adjusted on arms to fit various sizes of coils.

**"DOW CORNING  
SILICONE INSULATION  
PAYS OFF PROFITABLY  
FOR US AND FOR  
OUR CUSTOMERS."**



**L. J. WHITTED, Owner**  
**CLINTON ELECTRIC MOTORS**  
Clinton, Iowa

**E**VERY motor that enters your shop is a failure. Quite often, a simple repair or rewind job will restore its usefulness. But many failures are repeaters. Those are the motors that come back to you again and again, simply because of the severe but unavoidable conditions under which they must operate. It's not your fault, but your reputation is almost certain to suffer. It's part of your job to make custom-built motors out of standard equipment.

That's where Class H insulation made with Dow Corning Silicones comes in. If a motor is subject to abnormally high ambient temperatures, high starting torque, overloads or excessive moisture, Dow Corning Silicones can make it last 10 times longer than it ever did before.

That's why more and more maintenance, production and top management men now specify Class H insulation for hard-working motors. Only Class H insulation gives them the kind of motors they need, and it pays for itself many times over by eliminating down time, wasted man-hours and replacement costs.

And that sets you up as an authority on difficult motor problems, too. You gain first consideration, even for ordinary jobs. You earn a better profit margin on Class H; you gain prestige and win those new customers that increase your total volume of business. That's why:

***Dow Corning Silicones Build  
Rewind Business!***

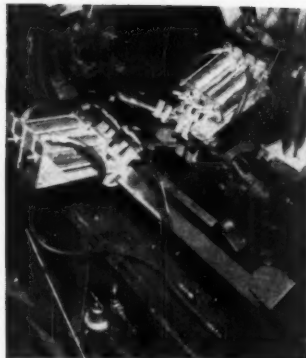
**Write  
Today**

For more information, technical or sales assistance, call our nearest branch office or write to Dept. G-12.

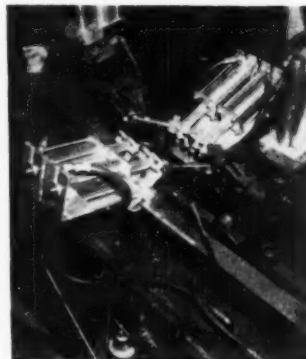
**DOW CORNING CORPORATION**  
**MIDLAND, MICHIGAN**

ATLANTA • CHICAGO • CLEVELAND • DALLAS  
LOS ANGELES • NEW YORK • WASHINGTON, D. C.

**DOW CORNING  
SILICONES**



**COIL IS SPREAD** after air-operated fingers are closed and nose clamps are fastened on coil ends. Elevated cylinders at right and left put arc in completed coil.



**IN LAST STEP** coil fingers and end clamps are released. After spreader arms are closed, coil will be lifted off. Unit will then be ready for repeat operation.

sioned, uniformly formed coils can now be made in quantity with comparatively unskilled help. And fatigue is a thing of the past.

A total of eight air cylinders is used. Two large units under the "bed" of the spreader frame actuate the lower cross bar (formerly operated by foot pedal lever) which pulls apart the spreader arms. A lever on the table operates a valve which controls these cylinders. Two smaller air cylinders on each of the spreader arms are equipped with interlocking metal fingers to hold the coil firmly during the spreading operation. One set of fingers on each cylinder is stationary and acts as a support for the hairpin coil. The other set of fingers is operated by the cylinder plunger and holds the coil firmly in place. The spreader arm cylinders are controlled by a foot pedal valve and the fingers can be quickly adjusted to fit any thickness of coil. A cylinder on each nose clamp at the coil ends raises the



# Everything!

**EVERYTHING YOU NEED  
EVERYTHING YOU WANT**

## IN JUST SIX CUTLER-HAMMER MULTI-BREAKERS



### 1. SINGLE POLE

The Multi-Breaker for minimum needs. Ask for MO1



### 2. TWO POLES

The Multi-Breaker for small homes. Ask for MO2

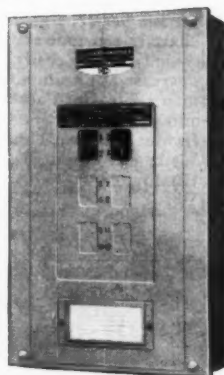


### 3. FOUR POLES

in a single block.  
One and two pole combinations. Ask for MO4

### 4. 4 POLES, BASIC 3-6-7-8 POLES

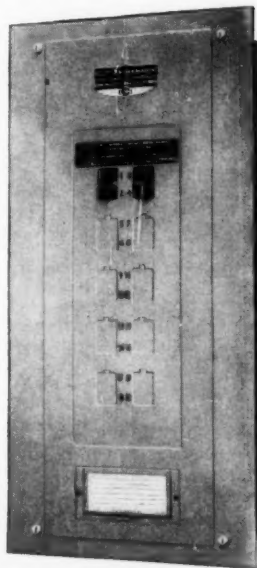
Made by adding single pole units. Ask for MO8



### 5. 4 POLES BASIC UP TO 12 POLES

Made by adding four-pole "plug-in" units. Ask for MO12

**UP TO 20 CIRCUITS  
FOR ALL DOMESTIC  
PROTECTION NEEDS**

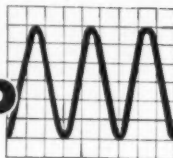
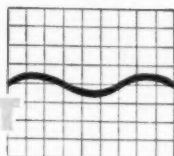


### 6. 4 POLES BASIC UP TO 20 POLES

Made by adding four-pole "plug-in" units. Ask for MO20

**SOFT**

**...or LOUD**



# Signals do the directing...



**FARADAY KODAIRE**

The noisy part of the plant responds to the air blast signal of Faraday Kodaire. Where sound levels are high or varied, it commands attention with a high powered trumpet blast—perfect for mills, foundries, industrial plants, either inside or outside. Try it on your next new or replacement job.



## OR BUZZERS!

Where noise levels may not be quite so varied or loud, the Faraday Buzzer is a perfect signal. It provides a sharp buzzer tone at high frequency which can be easily increased or decreased by a simple screw adjustment. Fits Uni-Pact adapter plate and can be incorporated into the famous Faraday Uni-Pact system. Write for Sperti Faraday Signal Catalog.

*Sperti Faraday Inc.*

**ADRIAN, MICHIGAN**

BELLS • BUZZERS • HORNS • CHIMES • ULTRA-VIOLET SANITIZERS • VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS

clamp to form the arc in the completed coil. These two cylinders are operated by a second lever-controlled valve on the spreader table.

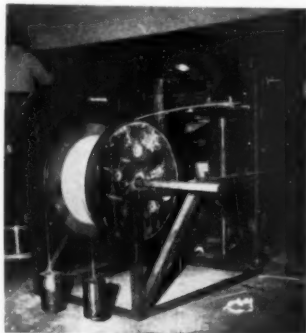
To operate the equipment, the mechanic opens the fingers on the coil cylinders and closes the spreader arms. In this position, the stationary fingers are interlocked. The hairpin coil is then placed over these interlocking fingers and the nose clamps tightened on the coil ends. Next the movable fingers on the coil cylinders are closed by operating the foot pedal. The coil is now firmly positioned for the spreading operation.

A flip of one lever actuates the "spread" cylinders and the spreading arms move outward to form the coil. A flip of a second lever operates the end cylinders and the coil ends are lifted to produce the proper arc. Air in all cylinders is then released and the spreading arms returned to their closed position. Once the end clamps are unlocked, the coil can be lifted from the unit.

Management at Willey-Wray notes these advantages: Coil spreading is simplified. Better quality coils can be made quickly and in quantity; are easier to fit into slots. Errors due to variation in foot pressure of different operators are entirely eliminated and untrained help can be taught to operate the equipment in a very short time.

## Weights Create Wire Reel Tension

Wire reels are supported by angle-iron frames in the transformer shop of the Electric Motor and Repair Company, Raleigh, N. C., and, to keep the wire from becoming slack, tension wires are passed over the rims of the reels. This is accomplished by fastening sections of 5-inch shafting to the ends

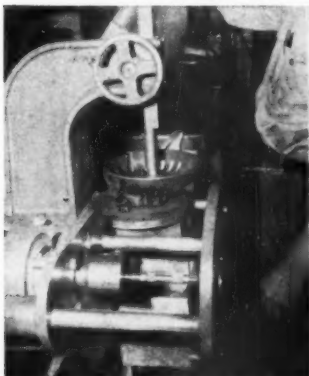


**SECTIONS OF SHAFTING** are attached to the ends of 1/8th-inch cable and cables are run over grooved reel rims to prevent wire from unreeling when not required by winders.

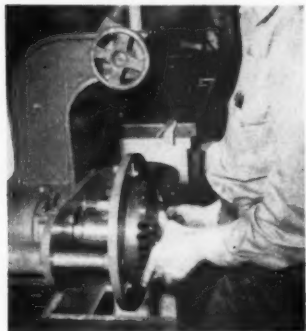
of two lengths of  $\frac{1}{2}$ -inch cable, the cable running from the upper cross member of the supporting frame and passing over the grooved reel rims. The tension is such that the reels may be rotated by a slight pressure, without having the wire unreel when not desired.

## Expansion Reamer Enlarges Bushings

When standard-sized bushings will not quite fit the sockets of fractional-horsepower motor and bells, the sockets can be slightly enlarged by using an expansion reamer. In the shop of Murph Miller's Tennessee Electric Motor Service, Knoxville, the reamer is held in a motorized chuck and the end bell is pressed against a flange plate. The plate held away from the reamer by spring tension, is moved inwards by the operator. When the operator releases this hand pressure, the spring tension pushes flange plate and end bell away from the reamer.



**REAMER** is held by chuck, while flange plate is held out from the cutting blades by means of spring tension.



**END BELL** is placed on flange plate, pushed in by operator against reamer. Foot pedal controls reamer speed.

*Build*

**BETTER PERFORMANCE  
GREATER PROFIT  
into every job**

**CONTRACTORS:**

When you build a G-E time switch into any electrical installation, you build extra convenience, economy, and safety for your customer—added profit for yourself.



## TIME SWITCHES

Every electric circuit requiring repetitive on-off control needs *automatic* control by a G-E time switch. Take a look at these applications. Have you considered them all? Have you pointed them out to your customers? There are benefits in each for both you and your customers.

There's a G-E switch to handle any of these jobs . . . . . or any special application that may exist on the job you're handling right now.

### QUALITY BUILT— EASY TO INSTALL

Both switches feature large silver contacts and the ever-reliable, permanently lubricated Telechron® motor. Roomy wiring space, simple knockouts, and a mechanism that is easily removed from its case make installations a snap.

Better put G-E time switches on your check list for every job. You can get them from your local G-E distributor. And if you want more details, write for bulletins GEC-535 (T-27) and GEC-578 (T-47). General Electric Co., Schenectady 5, N. Y.



Type T-47 Handy Time Switch. For circuits requiring one ON-OFF operation every 24 hours. Handles ON periods from five minutes to 22 hours.

- Store-window lighting
- Electric-sign control
- Refrigeration defrosting
- Electric-appliance control
- Apartment-hall lighting
- Factory-yard lighting
- Heater and cooling control
- Public building lights
- Conveyor, fan, solder-pot, or oven control in factories.



Type T-27 is the switch for almost any job. Performs up to 12 ON-OFF operations during any 24 hours. Available with astronomic dial or day-omitting device if desired.

**GENERAL  ELECTRIC**

# The best looking cap on the market

IS THE QUICKEST  
AND EASIEST TO INSTALL!



**Cut your installed costs on SEC jobs  
by using T & B Entrance Caps\***

A simple 4-step installation does the trick:  
(1) Loosen one screw (it won't fall out); (2) slip insulator out of cap; (3) lay the wires in the insulator and replace; (4) tighten one screw and the job's done! Die-cast cap is close-fitting to keep weather out of cable—die-cast aluminum to prevent staining of woodwork. Simple instructions cast right into cap.

## T & B SEC WATERTIGHT CONNECTORS ARE COLOR CODED



for Positive Cable Size Identification  
For a quick, tight job *all the way* on SEC, use T & B Watertight Connectors too. *Quick*, because all popular sizes have color coded rubber bushings

for easy selection—and are *further* size identified by printed color disc. *Tight*, because the double bevel on the rubber bushing tightens it against cable for its entire length.

T & B Caps and Connectors are UL approved, of course!

## ENGINEERED RIGHT... DISTRIBUTED RIGHT!

Like all T & B fittings, SEC Caps and Connectors are furnished under the T & B Plan 100% through your local T & B distributor. For further information or samples, see your local T & B distributor, or write us.

\*patented



THERE'S A

**T & B**  
**ENGINEERED**  
**PRODUCT**

for every  
wiring job  
in the  
complete T & B  
line of fittings  
for all  
conductors and  
raceways.



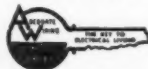
## THE THOMAS & BETTS CO.

INCORPORATED

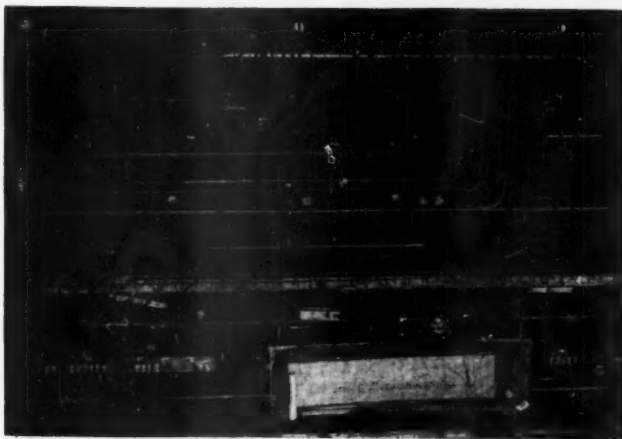
34 Butler Street  
Elizabeth 1, New Jersey

Thomas & Betts, Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1898



# Practical Methods



**CONDUIT SYSTEM** installed on wood forms follows routing indicated by circuit numbers and conduit sizes painted on forms. Data was transferred from detailed control raceway plan; eliminated frequent references to blueprints.

## Circuit Numbers Painted On Forms

### WIRING

An effective layout scheme for control conduits was employed by Hatfield Electric Company (South Bend office), when it installed the electrical equipment in a switch house addition to the power plant at The Studebaker Corporation in South Bend, Indiana. There was no question on the part of electricians as to which conduit went where and how. All information was right in front of them on the forms for the concrete floor.

Hatfield's field engineer had his layout crew use the wood form as a large drawing board. On it they transferred circuit information from their detailed plans. Circuit numbers and conduit sizes were painted on the form at the location where the conduits would run. The same scheme was used where conduits turned down and on templates at grouped stub-up locations. Sample notations: 63-1"; 61-1½"; 62-¾".

Mechanics in the installation crew did not have to refer to the detailed plan each time a new conduit run was assembled. Doubt and confusion were eliminated. Net result: man-hour economy and a neat installation of parallel conduit runs with a minimum of cross-overs and "bunching." And it effectively solved the problem of conduit stacking within the structural limits set by the slab thickness.

## Handling Aids Eliminate Battery Damage

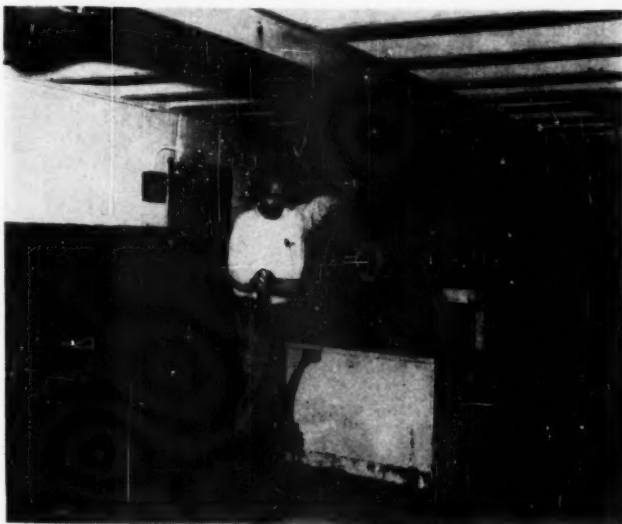
### MATERIALS HANDLING

More ton-miles per battery and lower battery and handling costs have been reported at the Wallingford Steel Company, Wallingford, Conn. These re-

sults were achieved by the virtual elimination of battery damage, through the use of a simple, homemade mobile battery rack for handling "walkie" truck batteries and a "short-haul" layout for placing "rider-driver" truck batteries on charge. With these aids, a handling technique was developed which not only eliminated manual handling of industrial truck batteries and the hazards involved to personnel and equipment, but made possible the maximum utilization of space in the battery alcove, measuring only 15 ft. wide by 25 ft. long by 8 ft. high.

The battery rack is made of structural steel members mounted on casters. Upright members are spaced to support "walkie" batteries which are lowered between them to the base of the rack. The assembly firmly cradles the battery and provides against its falling when the rack is pushed from the "walkie" unloading point to the charger.

For lifting and lowering "walkie" batteries and for replacing "rider-driver" truck batteries when discharged, a spreader bar and electric hoist are used. The pick-up hooks at the extreme ends of the spreader bar engage lifting lugs on the ends of platform truck batteries. Another set of pick-up elements, one-foot in from each end, is used to change "walkie" batteries. To save head room, the spread-



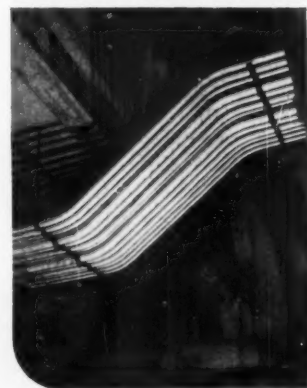
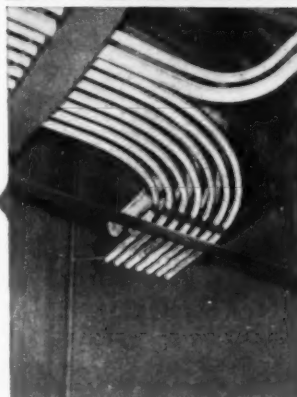
**SPREADER BAR** and trolley mounted electric hoist lift industrial truck battery from mobile battery rack.



**for a fast,  
clean job... make  
smooth, accurate  
conduit bends like  
these in minutes  
with a Greenlee  
Hydraulic Bender**

Look at these "tailor made", precise bends — just a few of the many made with a GREENLEE Bender at the Ralston Purina Plant in Bloomington, Illinois, by Kelso-Burnett Electric Co., Chicago.

In commenting on GREENLEE performance, this contractor says, "Greenlee Benders have been used by us on projects in many sections of the country since the time of their appearance on the market. They have always produced satisfactory and economical results for us." You, too, can do the job better, faster... make great time and material savings with the versatile GREENLEE. It's one-man operated, compact, portable... makes neat, perfect bends in just a few minutes in rigid and thin-wall conduit or pipe up to 5", tubing, bus bars. Get free Bender Booklet today. Write Greenlee Tool Co., 1752 Columbia Avenue, Rockford, Illinois.



**OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK**  
Hand Benders • Joist Bore • Cable Pullers • Knockout Tools • Auger Bits and Drills

er bar is attached directly to the hoist pulley housing, rather than to the usual hoist hook.

Horizontal movement of the batteries, to and from the charging unit, is accomplished by the overhead I-beam trolley mounting of the electric hoist. Large (5-, 6- and 8-ton) platform trucks pull up to an all-metal stop which is mounted on vertical I-beams set in the concrete floor. The spreader bar, hoist and trolley mount then facilitate the exchange of batteries over a maximum distance of only 20 feet: the discharged battery is placed on the charging unit; a recharged battery is replaced in the truck. The truck stop in front of the charging area prevents incoming trucks from accidentally ramming and damaging batteries being charged.

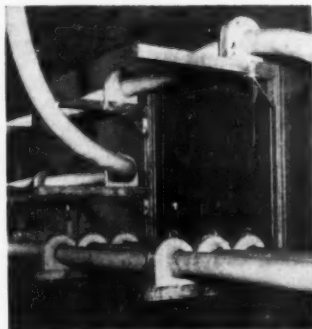
The advantages of this handling method have been well established. Freedom from excessive jolting or dropping of batteries and the time-saving ease of operation have reduced costs appreciably.

## Channel Inserts Hold Primary Cable Racks

—WIRING

A bit of forethought and planning in the design of the primary cable tunnel under the switch house addition to The Studebaker Corporation's power plant at South Bend, Indiana, paid a handsome return in the form of cable installation manhour economies. Giffels & Vallet, Inc., Detroit consulting engineers, in collaboration with Studebaker's plant engineering department, decided to use Unistrut P1000 channel inserts, uprights, bracket arms and insulator clamps to support the cable runs.

For Hatfield Electric Company



**ADJUSTABLE SUPPORTS** facilitated primary cable installation in this switch house tunnel; eliminated detailed dimensioning, drilling, welding and prefabrication. Unistrut channel inserts, uprights, and accessories cut installation time.



He's been getting in  
my hair for months!

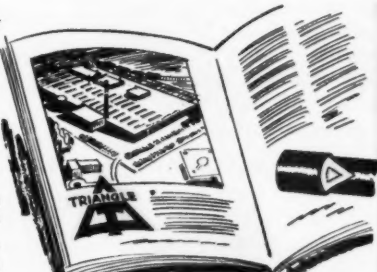
Nice guy—but fussy—purchasing agents have to be. We're designing an addition to his company's jet plane factory. He drops in frequently to make sure he gets only top quality material. We specified Triangle wire, cable and conduit—everyone knows there's none better.



"Here's a sample of Triangle's Glazon," I told him. "It has a glass braid that won't rot, burn, absorb moisture or deteriorate with age. You can't take chances with electrical failures—especially in defense plants. We specify Triangle because we know it's right."



I showed him a piece of Triangle Rigid Conduit. "This conduit is galvanized in 99.85% pure zinc—and see that tough coat of lacquer? It's a special formula made to Triangle's rigid specifications. It gives extra protection. It won't chip or flake on bending, which means, no breaks in galvanizing—no rust—no corrosion."



I showed him a picture of Triangle's New Brunswick Plant. "Millions of feet of electrical wire and cable a month are produced here to fill defense orders. Their machinery and methods are the most modern I've ever seen. When they say, 'It must be right,' you know it is right."



I'm an electrical engineer,  
take a tip from me. Use Triangle.

ASK YOUR ELECTRICAL  
DISTRIBUTOR—  
HE KNOWS—

**IT MUST  
Be Right**



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**TRIANGLE CONDUIT & CABLE CO., INC.**

NEW BRUNSWICK, NEW JERSEY

"Glazon" Building Wire - "Glazon" Non-Metallic Sheathed Cable - Armored Cable - Service Entrance Service Drop, Varnished Cambric Braided or Leaded, Tinsprene Trench, Power and Railway Cables, Bare Wire - Rigid Conduit Hot Dipped Galvanized and Black Enamelled - Flexible Metallic Tray Wire Conduit - Flexible Steel Conduit.

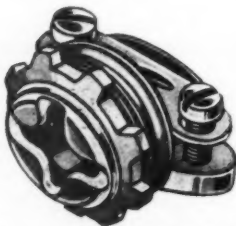
# for Performance that builds YOUR reputation

## SPECIFY AND INSTALL



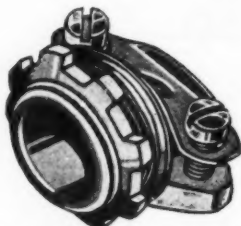
Here's top quality connectors that speed installation and insure better jobs. Blackhawk Connectors are made from smooth finished special cast alloy. They're strong, durable and will not rust. Formed steel clamp and solid steel lock nut with positive locking feature are heavily zinc plated. Full length filister head tapered point screws and full positive threads mean fast installation. Size:  $\frac{3}{8}$ " for  $\frac{1}{2}$ " K.O., Max. I.D.  $\frac{9}{16}$ ", Min. I.D.  $\frac{5}{32}$ ". More Blackhawk Connectors are used today than ever before. Your dealer recommends them.

**BLACKHAWK No. 470.**



For use with "ABC" cable or flexible conduit. Has accurate red head stop.

**BLACKHAWK No. 425.**



For use with non-metallic sheathed cable, portable cords, loom, or armored ground wire.

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**BLACKHAWK INDUSTRIES DUBUQUE, IOWA**



Entrance Cable Fittings . Staples . Yard Lights  
Sill Plates . Locknuts and Bushings . Wire Holders  
Fluorescent Brackets . Cable and Conduit Straps  
Connectors . Box Supports . Conduit Entrance  
Caps . Grounding Assemblies.

(South Bend office), electrical contractor on the project, it was merely a question of ordering the channel and accessories from a catalog. Hatfield's electricians had only to cut the channel to desired lengths, assemble the brackets and uprights and bolt them to the channel inserts. Detailed dimensioning, bending, drilling, welding and prefabrication were entirely eliminated. A hacksaw, wrench and screw driver were the only tools required for the simple assembly operation.

To take care of any eventual cable layout, three rows of channel insert were placed in each wall of the long tunnel; two parallel rows were installed in the ceiling. The long inserts were nailed to the wood forms before the concrete pour. Channel slots were protected with wax cardboard fillers and end caps.

Strut uprights run from the floor to just above the top wall insert; were bolted to the three wall inserts at the specified spacing for the 15 kv, 3-conductor, No. 4/0 fireproofed cables. Horizontal Strut supports, bolted to right-angle saddle brackets, were mounted to the uprights at specified vertical distances to form three, four and five tiers. Split porcelain insulated clamps hold the cable to the arm supports. Instead of training the heavy cables to conform to preset insulator positions, mechanics made final cable alignments just prior to full take-up on the insulator clamps.

Additional supports for future cable installations can be quickly and easily mounted to the existing channel uprights, or—if necessary—suspended from the ceiling Strut inserts as trapeze hangers.

### Pulling Cable Thru Right Angle Pull Box

#### WIRING

When Fischbach, Moore & Morrissey, Inc., electrical contractors of Chicago, was awarded the contract to change over the electrical distribution system at the Drake Hotel from direct to alternating current, they faced a job involving primarily heavy switchgear and feeders. The plans and specifications of consulting electrical engineer Ralph H. Decker called for more than 170 conduit and cable feeders to serve the electrical needs of the hotel. Most of the feeder conductors were of the 500 MCM size with conduits ranging from 3-inch to  $3\frac{1}{2}$ -inch diameter.

Installing cable raceways in an existing building is by no means a simple job, particularly where groups of 20 to 30 parallel conduits must follow irregular paths to bypass partitions, piping



**OVERSIZE PULLEY** guides heavy conductors (three 500 MCM and one 4/0 cables) around corner in continuous pull through a 90-degree pull box. 26 four-conductor feeders enter and leave this box.

systems, and other obstacles. In many cases, offset and right-angle pull boxes were installed in the conduit runs.

Frequently, low ceiling conditions and existing equipment on the floor ruled out the normal practices of pulling the cables through one side of a pull box and feeding into the other side. There just wasn't enough space.

When such conditions were encountered, F. M. & M. engineers decided to pull the feeders through the box. Cable reels were set up at the secondary switchboard cubicles in the basement. The winch was set up at the distribution panel.

The technique used to secure the continuous pull is illustrated in the photo. Here, a large right-angle pull box has twenty-six 3-inch and 3½-inch diameter conduits entering one side in a double tier and leaving the other side (at right angles) in a triple tier. As the conductors passed through the box, they went around a large diameter, wide concave face, wood pulley.

The pulley rotates freely on a metal shaft supported by a steel bar hanger. Large eye-nuts (with set screws) on each end of the shaft hold the pulley in the hanger. After the pull has been completed, one eye-nut is unscrewed, the hanger dropped and the shaft and pulley removed so the cables can drop out of the hanger. After it is again assembled and re-positioned the pulley is ready for another cable pull.

A steel cable through one of the eye-nuts suspends the pulley from a channel iron bar at the top of the pull box. Another cable around the hanger and anchored to the building structure, or other substantial supporting means, takes the strain of the cable pull.

By using this continuous pull method, F. M. & M. engineers were able to cut their cable installation time considerably.

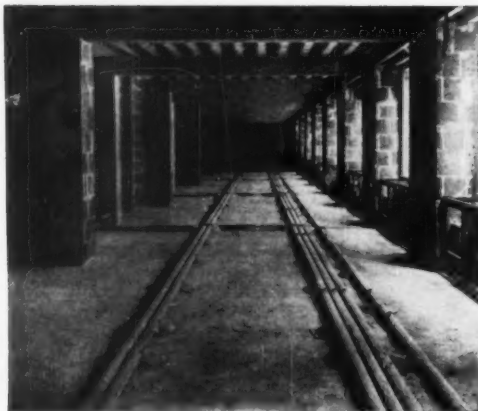
**WITH BRONCO 60**  
*Certified*  
PORTABLE CORD AND CABLE

**YOU GET**

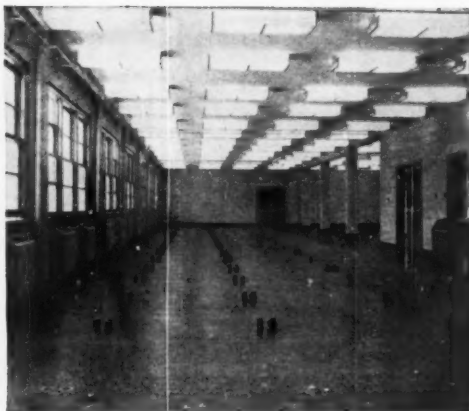
- MORE NEOPRENE IN THE PROTECTING JACKET! It is Certified to contain not less than 60% by weight of new Neoprene. This ... INCREASES SAFETY MARGIN, INCREASES RESISTANCE, INCREASES SERVICE LIFE!
- LONGER-LASTING COLD RUBBER INSULATION!
- GREATER FLEXIBILITY!—engineered, rope-like flexibility.
- MORE CONVENIENCE! Jackets are branded with full identifying data. Coils are packaged in neat shelf cartons.

Bears symbol "P1168M," flameproof registration number of the U. S. and Pennsylvania Bureaus of Mines.

*Bronco 60 Certified is an Achievement of*  
**WESTERN INSULATED WIRE CO.**  
LOS ANGELES 58, CALIFORNIA



G-E Fiberduct raceways provide single-, double-, or triple-duct service—can be laid in a variety of patterns to concentrate distribution over any portion of floor.



Large G-E Fiberduct raceways provide ample facilities for the heaviest electrical demands—permit installation of outlets right where they're needed in a few minutes.

## Provide Complete Underfloor Distribution with nonmetallic G-E Fiberduct Raceways

Plan now to avoid materials problems and still provide ample underfloor distribution with nonmetallic G-E Fiberduct raceways.

G-E Fiberduct raceways offer the kind of over-all distribution that today's expanding electrical requirements demand. They put power where it's needed when new electrical equipment and changing floor layouts call for flexible distribution.


Fiberduct raceways make it easy to install additional outlets at all times. An electrician cuts a hole through the floor

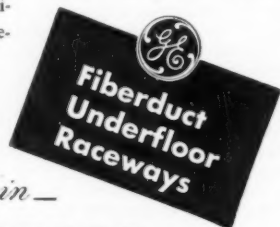
and the duct, pulls wires through and installs the outlet. New distribution is provided by merely pulling additional wires through the raceway. There's no interruption of building facilities . . . no annoyance to building tenants!

Complete specifications and installation data are available from your General Electric Construction Materials distributor. For a free copy of the G-E Fiberduct Data Manual, write to Section C57-1218, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



To add an outlet, simply make a small opening in the floor over the raceway, fish wires through, connect outlet.

*You can put your confidence in—*  
**GENERAL  ELECTRIC**





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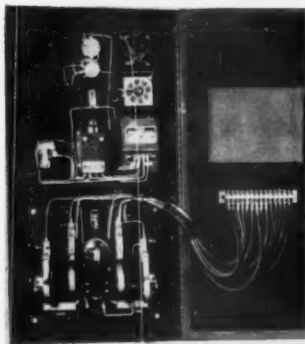
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See other side of this page.

# Product News

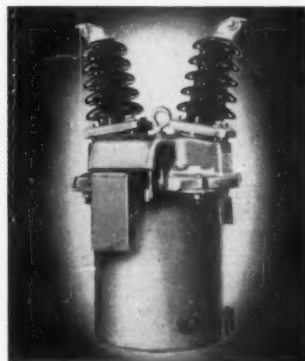


## Control Panel

(1)

Announcement has been made of new industrial Pantro automatic load transfer control panels. A close differential ac device makes it impossible for load to operate on under-voltage. This device prevents chatter and undue contact wear. They are custom-built to specifications. They assure continuity of power supply and maximum engine running time on a given amount of fuel. All units are mounted to make them accessible for inspection and servicing.

*Industrial Control Panel Co., 23 West Hubbard St., Chicago 10, Ill.*



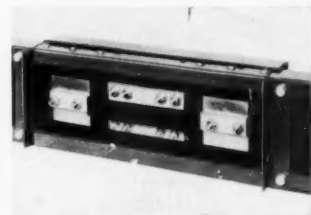
## Oil Switch

(2)

A new single-pole oil switch type CSO-1, has been announced. Developed primarily for control of small banks of pole mounted capacitors, switch is suitable for sports field lighting, sheet lighting, airport lighting, and as a load break sectionalizing

switch on rural and suburban distribution systems. It can be operated manually, or electrically by an automatic control device. Operating coils are interchangeable and provide 110, 220 and 440 volt-control. Single-pole switches can be ganged mechanically or electrically for three-pole switching duty. It has been designed for 15 kv and a thermal rating of 200 amperes. Current rating will vary with type of load.

*Westinghouse Electric Corporation, Pittsburgh 30, Pa.*



## Feed-In Duct

(3)

A new joint design in the Feed-In duct to reduce installation time and effort, has been introduced. With the new joint, it is no longer necessary to match left and right hand duct ends. All ends are identical in construction. Factory installed joint bolts face outward for accessibility. Only tie plates and nuts are needed to complete the joint. Other features include: low voltage drop, totally enclosed construction, balance voltage drop, high mechanical and dielectric strength. Available in capacities of 600 to 4000 amperes.

*Square D Company, 6060 Rivard St., Detroit 11, Mich.*

## Communication System

(4)

A new console-type two-way radio station, designed for fixed-station use in any two-way radio communications system operating in the 30-50 mc frequency range, has been announced. This new desk-type Fleetphone station, Model CSF-60A, combines a 60-watt transmitter-receiver and its power supply in one case. Provisions for remote control, optional two- or three-channel transmitter operation, dual-channel receiver operation, and use of local or remote-type speakers give this station versatility for such services



as police, fire, trucking, public utility, and petroleum industry communications. Unit may be mounted against a wall or on a shelf if desired. Transmitter chassis can accommodate two additional crystal tuning capacitors to permit three-frequency operation. The circuits are designed around tube types. Two toggle-switch controls are provided: one for the main ac line, the other to switch between transmitter and receiver operation.

*Radio Corporation of America, Camden, N. J.*



## Connector Body

(5)

A new 10 amp polarized connector body has been added to this line. It has the double T slot that accommodates both special T caps and standard parallel-blade caps. Molded of Bakelite, connector has an armored base and metal cord clamp—both coated to resist rust and corrosion. It is rated 10 amp, 250 volts, and 15 amp, 125 volts; cord hole diameter is .156 to .500; O.D. 1 1/2 inches.

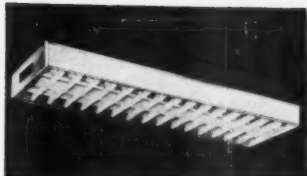
*Rodale Manufacturing Co., Inc., Emmaus, Pa.*



*Midwest Electric Mfg. Company*

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET  
Chicago 12, Illinois



**Lighting Fixture (6)**

A new fluorescent lighting fixture, known as Wafer-Thin, has been announced for commercial use. It uses 4-foot T-12 40-watt lamps. Dimensions are 49 in. long by 16 in. wide by 3- $\frac{1}{4}$  in. deep. It operates on 110-125 volts, 60 cycle ac and may be flush or suspension mounted individually or in continuous rows. Knockouts and holes are provided for mounting. Constructed of 20-gauge steel, it has a satin aluminum finish with translucent plastic sides. Steel louver is designed to provide illumination with angle of 23° crosswise and 20° lengthwise. "Trigger-action" on louver permits instant access for relamping, replacement of starters and cleaning. A closed accessory reflector is available. It comes in two pieces and may be used with flush mounted units.

*Mitchell Manufacturing Company, 2525 N. Clybourn Ave. Chicago 14, Ill.*



**Tester (7)**

The redesign of the 10-kv winding tester, for detecting insulation faults and winding dissymmetries in motors, generators, and coils, has been announced. The number of tubes is reduced from seven to four and it uses a smaller thyatron. A selenium rectifier replaces the tube rectifiers in the cathode tube excitation circuit. Tester consists of a repeating-type surge voltage generator, a cathode-ray oscillograph, and a synchronously driven switch for alternately reversing the direction of surge travel through the winding. Tester is contained in one cabinet. It has a surge generator capacitance of .05 mf, a voltage of 0.2 to 10 kv, and a

current capacity of 100 amperes. Motors as large as 2000 hp, 2300 volts may be given an adequate coil-to-coil and turn-to-turn test and device may also be applied to small and medium sized coils and dc armatures up to 20 hp, 220 volts.

*General Electric Company, Schenectady 5, N. Y.*



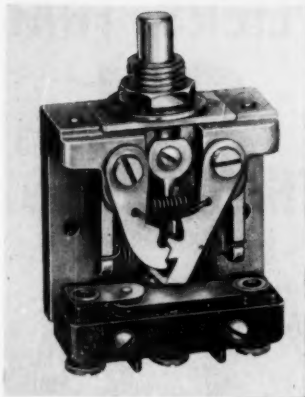
**Light and Heat Unit (8)**

Announcement has been made of a new household fixture called "Heat-A-Lite". It is a combination all-electric ceiling heater, overhead light and air circulator. It is installed in the ceiling and recommended for use in bathrooms, bedrooms, nurseries, recreation rooms and other small areas in the home to be heated, lighted and air circulated. It gives uniform warmth and recessed overhead light gives soft, non-glare illumination. For summer comfort, some models are equipped to operate without the heating element to provide a circulating flow of cool air throughout the room. It can be installed in both new and old homes.

*NuTone, Inc., Madison and Red Bank Roads, Cincinnati 27, Ohio*

**Switch (9)**

A new maintained-position switch, known as the Type "A-C-O" switch, has been developed for industrial use. Typical applications for this alternate-contact-operating switch are: on machine tools; circuit transfer of timers and recording equipment; in safety circuits; and as a limit switch. Operation is such that first press transfers the contacts, and second press restores them. Single-pole, double-throw contacts permit adaption to either normally closed or normally open circuits. Mounting is either single hole by means of a  $\frac{1}{2}$  inch threaded bushing, or top or side panel mounting with clearance holes for 6-32 screws. Overall dimensions are 2 inches wide, 2-



25/32-inches high including plunger, 1-3/32 inches deep. Contacts are rated at 20 amperes, 125 volts ac, non-inductive.

*General Control Company, 1200 Soldiers Field Rd., Boston 34, Mass.*



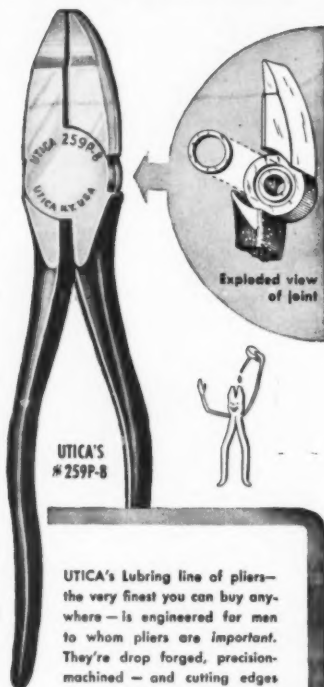
**Limit Switch (10)**

A new-type limit switch that is hermetically sealed has been announced. Because of hermetic sealing (with inert atmosphere) switch is considered proof against freezing, corrosion, explosions, accumulation of dust on contacts, tampering and misadjustments. No condensation within the enclosed mechanism from humidity and temperature cycling. A hardened steel pivot under diaphragm provides immobile support. Other construction details include double-pole, double-throw switching with nearly simultaneous break. Single-pole, double-throw is optional. A new design 4 or 8 pin connector eliminates condensation around terminals. Rubber-sealed outer connection is available for making connection to completely enclose outer terminals.

*Electro-Snap Division, The Exhibit Supply Co., 4218 West Lake Street, Chicago, Ill.*



# PLIERS THAT OIL THEMSELVES!



UTICA's Lubring line of pliers—the very finest you can buy anywhere—is engineered for men to whom pliers are important. They're drop forged, precision-machined—and cutting edges are induction hardened by a special UTICA process.

Each UTICA "Lubring" pliers has a ring of porous iron floating in the joint. This ring serves as a tiny reservoir for oil and releases it to the joint as it's needed.

In these days of limited replacements, why not make sure you get the long life and quality that go with UTICA?

**UTICA Drop Forge & Tool Corp.**  
Utica 4, New York

In Canada:  
Adlam Tool & Supply Co., Ltd., Montreal  
Wells-Irons, Ltd., Winnipeg



AND THE WORLD'S BEST TOOLS ARE MADE IN U. S. A.



## Switches and Receptacles (11)

Announcement has been made of a new series of weatherproof switches and receptacles for outdoor applications. The flat units can be mounted on walls, and the curved units are for mounting on pipes, poles or trees. They comprise a cast cover and surface plate on which the switch or receptacle is mounted. Mounting plate is arranged for drilling and tapping wiring outlet. Receptacles are for 2 wire, 15 amp, 125 volt, and 10 amp, 250 volt. Three wire Twistlock receptacles are also provided for 15 amp, 125 volt and 20 amp, 250 volt.

Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, Ill.



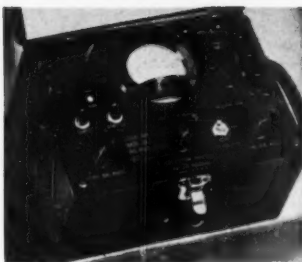
## Adjustable Floodlight (12)

A small adjustable floodlight is designed for permanent or temporary installation for residential, commercial or industrial applications. Unit is constructed of heavy gauge steel with a durable, weatherproof, infrared baked enamel finish. Reflector has medium base socket; has universal adjustable mounting for installation on any flat surface or directly to 3½ or 4-inch outlet box; is equipped with approved 6-foot cord and plug. Available in two sizes: 7½-in. dia. reflector for 200-300 watt lamp.

Jackson Electrical Co., 900 W. Van Buren St., Chicago 7.

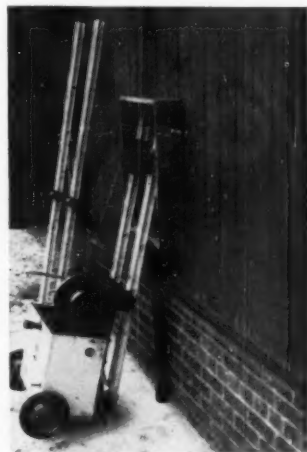
## Instrument (13)

A new testing and fault locating instrument now enables trouble-shooters and electrical maintenance men to determine the exact location of faults or crosses by a direct meter reading. It is a portable device which utilizes a new principle little affected by high resistance crosses or faults. It will detect the exact location of line-to-line



or line-to-ground crosses and is not affected by stray or parasitic currents invading ground connections. A built-in ohmmeter measures resistance from 0 to 2 megohms. Current is supplied by a self-contained battery.

R. F. Müller & Sons, Harvard, Nebraska.



## Cable Puller (14)

Announcement has been made of a Powercrat portable cable puller and power unit. Some of its uses are for pulling in new feeders—vertical and horizontal runs, and for pulling out old feeders, such as; jerking loose old dc feeders, removing cable supports and lowering them into basement, and pulling up new ac feeders in next operation. It also may be used for recovering old cable from conduit in buildings and for underground pulls in manholes or tunnels. Unit operates on 110 volt single phase current. It can also be used as a hoist, as well as a winch for setting heavy machinery in place. Power take-off may be used for threading heavy pipe.

Modern Suppliers, Inc., 1334 Webster Ave., Bronx 56, New York, N. Y.



This high-intensity installation of surface-mounted SKYLIKE units was selected for the modernization of the Amesbury, Massachusetts, Public Library. Note the low brightness levels even at the light source . . . the effectiveness of the 90° shielding . . . the absence of harsh shadows and sharp light cut-off lines.



A patterned group of recessed units in the dining room of the Bader Hotel in Spring Valley, N. Y. illustrates the way Silvray SKYLIKE fixtures fit 24" x 24" ceiling tiles. Note how the soft, even distribution of low-intensity light helps to create the desired mood of cheerful hospitality.



Architect Harvey P. Clarkson of Petroff and Clarkson, New York, N. Y. specified this suspended Silvray SKYLIKE installation for the conference room jointly used by the Tea Association and the Tea Bureau, Inc., at 500 5th Ave. Providing a medium lighting intensity of approximately 35 foot-candles, these SKYLIKE units represent an initial investment saving of from 1/3 to 1/4 the cost of competitive equipment offering comparable results. The lighter weight and internal simplicity of the fixtures also permits additional savings in installation time.

## SKYLIKE® Lighting— "Installation-proved"

IN SCHOOLS, OFFICES, STORES,  
AND PUBLIC BUILDINGS

Blending the soft, indirect light of silvered-bowl incandescent lamps with the modern look of fluorescent-type troffers, Silvray SKYLIKE units permit an almost unlimited variety of exciting new lighting applications.

As recessed, surface-mounted, or suspended units . . . in patterned groups or ernization you're sure to like the versatility, efficiency, and low cost of SKYLIKE fixtures.

**Look at these  
typical installations!**

(Unretouched photographs, using room light only, demonstrate the unusually uniform distribution of light provided by SKYLIKE fixtures.)



SKYLIKE fixtures assure adequate, comfortable illumination for employees of the Stewart Company in its Dallas, Texas, offices. The Stewart Company, a well-known distributor of Ford tractor and Dearborn farm equipment, also benefits from the unique construction of SKYLIKE units—construction that permits floor-level relamping with pole-type lamp changers . . . quick changes in light-distribution characteristics . . . and variable light output through interchangeability of 150- to 500-watt lamps.



Send for complete SKYLIKE information. A comprehensive booklet describing the SKYLIKE system is yours for the asking. To get your copy, write Graybar Electric Company, Inc., Graybar Building, 420 Lexington Avenue, New York 17, N. Y. S110-412

**SKYLIKE LIGHTING INC.**

...A SILVRAY ASSOCIATED COMPANY





No. 5025-SLRG  
Grounded Lamp  
Guard with  
Concentrating  
Lens.

No. 5025-SRG  
Grounded Lamp  
Guard. Closed  
end cage.

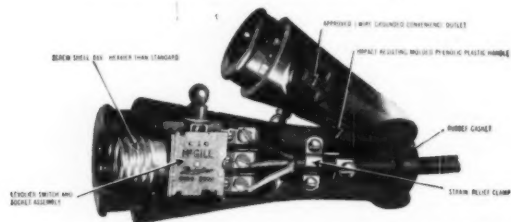
## NEW completely grounded portable lighting

### McGILL® 5000-G series 3-WIRE Portable Lamp Guards

Now you can have completely grounded portable lighting that complies with all Underwriters' Laboratories requirements for 3 wire grounded electrical systems in so many modern plants. In addition the new McGill 5000-G Series Lamp Guards offer industry the first fully grounded portable with an Approved 3 wire convenience outlet. This provides a connection for drills, saws or other power tools quickly at the working area — without extra extension cords.

The 5025-SLRG model has an impact resisting molded phenolic handle that is positively insulated. It is equipped with a lensed cage for illuminating otherwise inaccessible areas, a built in LEVOLIER switch and 16-3SJ red thermoplastic cord and plug. Available without cord and with closed end cage as 5000-SG.

Select a suitable model at your electrical wholesalers or write for descriptive literature today.

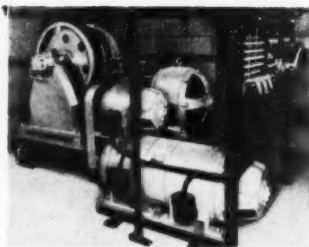


Available from your electrical wholesaler

ONLY McGill  
MAKES *Levolier*  
SWITCHES

McGILL®

Mc Gill Manufacturing Co., Inc., 450 N. Campbell St., Valparaiso, Indiana



### Elevator Motors

(15)

Announcement has been made of a new line of motor drives for passenger and freight elevators. Installations utilize either dc variable-voltage type drives or two-speed and single-speed ac types. Motors are made in integral hp sizes with polyphase ratings and in all commercial frequencies. Available in a variety of enclosures, including drip-proof, splash-proof, totally enclosed fan cooled, and totally enclosed non-ventilated. Heavy cast frames are corrosion resistant, and each motor in dynamically balanced.

*Electro Dynamic Division, Electric Boat Company, Bayonne, N. J.*

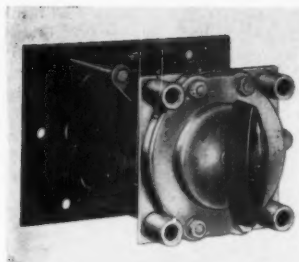


### Floodlight

(16)

Announcement has been made of a new line of porcelain elliptical type floodlights, known as "Space-Liters", Series 2500. Units are available with mounting fittings for crossarm, wall, pipe or pole top applications and for general service type PS-52, 300-1500 watt lamps, Bi-post type T-24, 750-1000 watt lamps, and mercury vapor lamps Type T-16, 400 watt. Cast aluminum neck is attached to reflector by a back-up flange and six screws. Necks also contain wiring compartment, entrance to which is made through a weatherproof gasketed cap. Lamp socket is mounted in cap, which is also provided with a 1/2 inch threaded opening equipped with insulating bushing to protect service leads.

*Stieber Manufacturing Company, Broadview, Ill.*



## Switches

(17)

Announcement has been made of rotary packet switches. They are made for controlling electrical circuits operating at current ratings of 10, 25, 30, 60, 100, 200 and 500 amperes and voltage ratings from 115 to 600 volts ac, and up to 250 volts dc. Construction consists of molded phenolic sections, which can be stacked in the quantity required for any given circuit. Sections are fastened together between a steel base plate and top plate and held in place by two or more securing rods running along the sides and connected to both base and top plates. Any two sections connected to each other form an individually sealed switch unit with a rotor (or movable contact) fastened to a common operating shaft. These connect with stationary terminals extending through the outer wall of the deck. Operating mechanism, enclosed in a cover on top of switch, consists of a special spring loaded device and eccentric cams which provide positive snap action.

Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.



## Brooder Heat Reflector

(18)

A sturdily constructed, heavy gauge steel reflector for use in live-stock (chicken, pig, etc.) brooders has socket to accommodate 150-200 watt incandescent lamp or 250-watt heat lamp. The 14-in. dia. reflector has durable, infra-red baked enamel finish; can be attached direct to brooder or suspended from special hanger. Comes equipped with approved 6-foot cord and plug.

Jackson Electrical Company, 900 W. Van Buren St., Chicago 7, Illinois.

FULLMAN

# Latrobe

PRODUCTS

★ FLOOR BOXES ★

WIRING SPECIALTIES

## CONVENIENT and PRACTICAL

"Latrobe" Floor Boxes and Wiring Specialties are designed for quick and easy installation.

Each "Latrobe" product is constructed of finest materials to perform its job with the greatest effectiveness at least cost.



No. 284 Nozzle with  
No. 200 Cover Plate

This Duplex Receptacle Nozzle fits neatly and compactly and is very efficient in operation. Is furnished with 1/2" Brass Pipe Extension. 3/4" Extension can be furnished if required.



No. 252-R "Latrobe"  
Two Gang Box

This Two Gang Adjustable Floor Box is efficient and economical. One section has No. 208 Receptacle. One Cover Plate has 1/2 in. Flush Brass Plug and the other Cover Plate has 2 in. Flush Brass Plug.



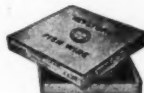
No. 330 Tom Thumb  
Utility Outlet

This handy general purpose outlet can be quickly installed in wood floors, mantels, baseboards, show windows and other installations free from moisture or mechanical injury. No harm done to finish.



No. 110 "Latrobe"  
Water-tight Box

The unique and practical design of the "Latrobe" 110 Floor Box makes a safer job and leaves more wire space inside the box. 15 to 20 minutes installation time is saved on each box. 3 1/2 in. diam. Cover Plate.



Kelstone Fish Wire

Tamped just right—Ten sizes—ranging from the lightest work up to the heaviest power wiring—100—150—200 ft. coils.

Sold Only Through  
Wholesalers



No. 1050 Cable Staples  
for Romex and  
Non-Metallic Covered Cable

These dependable, high quality staples are especially suited for Romex and Non-Metallic Covered Cable. Staples are 1 1/2 long and 9/16" wide. Packed in box, carton and keg.

FULLMAN MANUFACTURING CO.  
LATROBE . . . PENNSYLVANIA

**A Twist of the Wrist  
and  
IT'S LOCKED!**

**NEW**

**Turn-Tyte**

**INTERLOCKING  
DEVICES**

**by RODALE**



Got a wire connection problem on industrial equipment? New **TURN-TYTE Cord Connectors, Caps and Receptacles** are your answer!

**YOU SAVE TIME!**



**Slight turn locks them TIGHT!**

**TURN-TYTE 2-Wire Armored Cord Connector Body.** Two pieces of molded bakelite, with armored base and cord clamp. Bronze contacts coated to resist rust and corrosion. Available in 10-15 amps. (# 2100) and 20 amps (# 2200).

**YOU SAVE MONEY!**



**...they're fully INTERCHANGEABLE with other makes!**

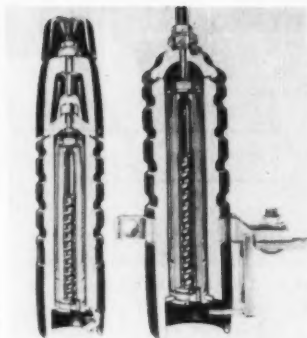
**TURN-TYTE 2 Wire Armored Cap** with cord clamp. Bakelite with brass blades. Available in 10-15 amps (# 1206) and 20 amps (# 1226).

**SOLD ONLY THROUGH  
LEADING WHOLESALERS**

If your wholesalers cannot furnish you with **TURN-TYTE** devices, we will be pleased to send a new catalog and names of suppliers in your area who can fill all your **RODALE** needs.

Also Available: 3-Wire, Polarized and Grounded. 10-15 Amps and 20 Amps.  
**IMMEDIATE DELIVERY!**

**RODALE**  
MANUFACTURING CO., INC.  
EMMAUS PENNSYLVANIA

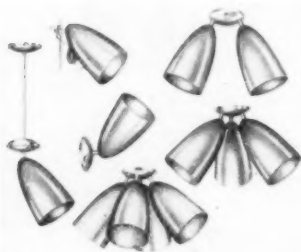


## Lightning Arrester

(19)

A new De-ion expulsion-type lightning arrester, type LX, for protecting distribution apparatus has been announced. It incorporates a new method of limiting power follow current on systems having fault currents as high as 20,000 amperes. A spiral fiber filler lengthens the power arc path to four times the original spark. Sparkover values are kept low by high field stresses between the upper electrode and the metal shield surrounding the fiber arc chamber. Built to AIEE and NEMA standards, arrester is available in ratings of 3, 6, and 9 kv, and will later be available in ratings of 12, 15, and 88 kv. The top gap arrester is designed for standard crossarm application. Bottom gap arrester is designed for crossarm mounting and can be adapted for transformer mounting.

Westinghouse Electric Corporation,  
Pittsburgh 30, Pa.



## Floodlight

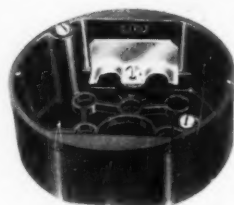
(20)

A new lighting unit, known as "Show-Master," to accent displays, either by flood or spotlight, has been announced. Available for wall, suspended or flush ceiling mounting, as well as for portable use. Clamp-on type also available for attaching to existing stems of fluorescent fixtures, or to poles or pipes bordering any display. It is adjustable, and each unit can be directed to spot needing accent.

Available in 6, 12, 24, 48 and 60 inch stem lengths, for coupling to existing short stem units. They are designed for use with R-40 or PAR 38 lamps. Use of 150 watt lamps is recommended. Ventilation is provided in the 6 in. by 9- $\frac{1}{8}$  in. torpedo shaped reflector, which is finished in satin grey enamel. Glass color filters can be had for each reflector and are provided with clips that snap on.

Revere Electric Mfg. Co., 6009  
Broadway, Chicago 40, Ill.

(21)



**NON-METALLIC BOX** No. 4060 has been announced. It is a two clamp, four wire box. Two No. 36 clamps mounted at opposite ends of the box will take various sizes of non-metallic sheathed cable. It is a 4 in. octagon box, 1 $\frac{1}{2}$  in. deep and 1 $\frac{1}{8}$  in. high. Two 21/32 in. diameter knockouts on each side. One  $\frac{7}{8}$  in. diameter knockout in bottom. Outside diameter is 4 inches. Listed by Underwriters' Laboratories, Inc. Manufactured by Union Insulating Company, Inc., Parkersburg, W. Va.

## Sealing Compounds

(22)

A new line of sealing compounds especially designed for use where high electrical insulation and low moisture transmission are required, has been announced. Known as Permo Potting and Sealing Compounds, they have a wide variety of uses in such fields as electronics. They are particularly recommended for special high electrical resistance where retention of viscosity over wide temperature ranges is necessary.

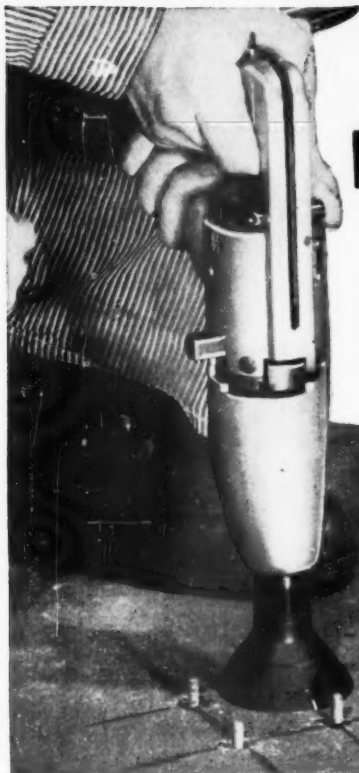
H. V. Hardman Co., Inc., 571 Cortlandt St., Belleville, N. J.

## Panelboard

(23)

These Narro-Unit panels are fusible panelboards specially designed to meet conditions where space limitations are a factor. Where width is a factor,





**Fastens steel or wood to  
concrete or steel in seconds!**

**NEW CARTRIDGE-POWERED**

**MODEL 450**

# REMINGTON STUD DRIVER

**Sets fastening studs up to 100 times faster than conventional methods...needs no outside power source**

You can speed construction and maintenance fastening jobs and cut costs with the amazing new Remington Stud Driver. This simple tool attaches steel or wood pieces and fittings to concrete or steel . . . easily sets as high as 5 fastening studs in a minute. No outside power source or other equipment needed. It's compact, rugged, *safe*. Test-proved to be the world's finest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., America's oldest and foremost sporting arms manufacturer. For detailed information and the name of your nearest distributor, fill out and mail the coupon below. There may be slight initial delays on delivery until production and distribution catch up with demand.

## LOOK AT THESE EXCEPTIONAL FEATURES

**COMPACT AND PORTABLE**—Weighs only 5½ pounds, ideal for scaffold, ladder, overhead work, inaccessible places. Comfortable to use in any position.

**SPEED**—One man can set up to 5 studs per minute, as much as 100 times faster than other methods. Sets stud at whatever depth is required up to 2½ inches, depending on material.

**ELIMINATES INVESTMENT IN OUTSIDE POWER**—Self-powered. Especially useful in isolated places.

**TRIPLE SAFE**—Plainly visible red dot indicator shows when it's cocked; safety must be depressed before and during squeezing of main trigger; permanently attached safety shield must be compressed against work before Stud Driver will operate.

Trigger can't be accidentally tripped. Slight recoil. Low noise level.

**WIDE VARIETY OF STUDS** are available for every fastening job. Genuine Remington studs are trademarked for user's protection. Pull-out resistance as high as two tons in good concrete, depending on stud used. Cartridges are available in 5 power loads covering practically all fastening needs.

**UNIQUE, FAST ASSEMBLY OF STUD AND CARTRIDGE**—Tough plastic heel cap permits lightning assembly of any cartridge with any stud, identifies power load, protects head and thread of stud during driving.

**PRICE** for Model 450 Remington Stud Driver complete in rugged steel carrying case—only \$119.50.

## How to operate the Model 450 Remington Stud Driver



Hand-assemble stud and power cartridge, load as unit in easy-to-open Stud Driver, close.

Press loaded Stud Driver firmly against working surface, depress safety button, pull trigger.



Explosive charge imbeds stud solidly. Open Stud Driver with twist of the wrist, eject empty shell, load again. Whole job takes seconds!

## Speeds all these jobs . . . and many more

1. Hanging steel sash and door bucks to concrete and brick.
2. Anchoring wood plates to concrete floors and ceilings for setting partitions.
3. Fastening wood furring strips to concrete for attachment of metal lath.
4. Anchoring suspended ceilings, sprinkler systems and lighting fixtures to concrete.

5. Attaching conduit and panel boxes to steel and masonry.
6. Anchoring light machinery to concrete pads.
7. Erection of signs, awnings and venetian blinds on steel or masonry.
8. Hanging radiator housings to concrete or brick.

"If It's Remington—It's Right!"

**Remington**



## MAIL THIS COUPON TODAY FOR FURTHER INFORMATION

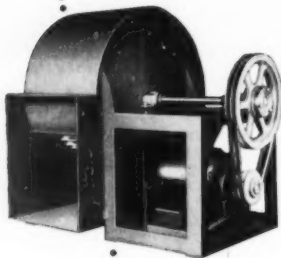
Remington Arms Company, Inc.  
Industrial Tool Division  
938 Barnum Ave., Bridgeport 2, Connecticut

I am interested in obtaining detailed information on the Model 450 Remington Stud Driver.

Name \_\_\_\_\_  
Firm \_\_\_\_\_  
Position \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

# HERE'S YOUR COMPLETE COMPACT, VENTILATING BLOWER

*Peerless Electric*



## BELT- DRIVE UTILITY BLOWERS

Peerless Belt-Drive Utility Blowers are designed to deliver large volumes of air at extremely economical cost. These blowers are widely used for general ventilation and exhaust where duct systems are required. The units are compact, easy to mount and quiet in operation.

### HOUSING AND WHEELS

The arc-welded housings are constructed of 16-gauge steel, with sturdy spot-welded motor bases. Wheels are dynamically balanced.

### MOTORS

Peerless manufactured. Available in all types of current characteristics.

### ROTATION AND DISCHARGE

Furnished either for clockwise or counter-clockwise rotation and to discharge in any direction.

### CUSTOM FEATURES

Weatherproof covers, available for outside installation, eliminate the need for penthouse or other protection. Inquiries are invited for other special features that may be desired.

### CAPACITIES

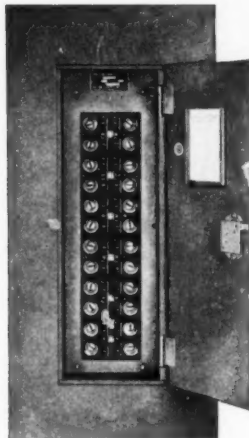
Tested in accordance with standard test codes.

*Write for complete specifications*

**THE PEERLESS ELECTRIC COMPANY**

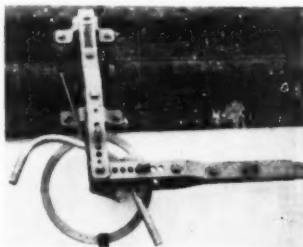
Established 1893 • WARREN, OHIO

*Peerless Electric*  
**MOTORS • FANS • BLOWERS**



single row construction is advised using either the switch and fuse NTPR or the plug fuse only NPR panel. They are 13 inches wide and have 4 inch gutters, permitting mounting panels between building studs. Using double row construction as in the NTP2R and the NP2R it is possible to obtain many additional circuits. Adapting these panels to any special circuit requirements is done with the use of six combinations of single pole and double pole tumbler switches and plug fuse only blocks. Switches are rated 30 amp at 125 volts.

*Kolton Electric Manufacturing Co.,  
123 New Jersey Railroad Ave. New-  
ark 5, N. J.*



### Conduit Bender

(24)

A new type of bending die that adapts the Hossfeld No. 2 Universal iron bender to bending of thin wall electrical metal conduit, has been announced. It makes round, smooth, wrinkle-free bends of all standard sizes of thin wall conduit from  $\frac{1}{2}$  inch to 2 inches. Full 90° bends in conduits of  $1\frac{1}{4}$  inch size or smaller are made by direct leverage with one sweep of hand lever. A new compound leverage principle is used in bending  $1\frac{1}{2}$  inch and 2 inch conduit.

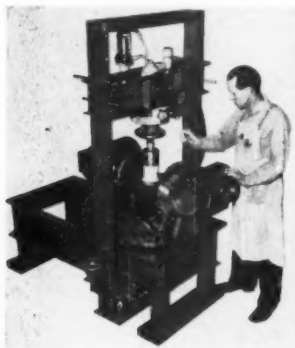
*Hossfeld Manufacturing Company,  
Winona, Minn.*



**Spotlight (25)**

This slimline spotlight provides "down-punch" light for highlighting merchandise and displays. Model No. 363, mounts in-line with Mitchell open-type slimline models or with louvered shielded slimline models. Unit may be mounted between fixtures or at ends of rows or individually. PAR-38 projector spot or flood lamps are used. A smooth gimbal ring permits adjustment of light in any direction. Unit is made of 20 guage steel and finished in baked white enamel. It is 10 in. long, 8- $\frac{1}{4}$  in. wide and 5- $\frac{1}{2}$  in. deep.

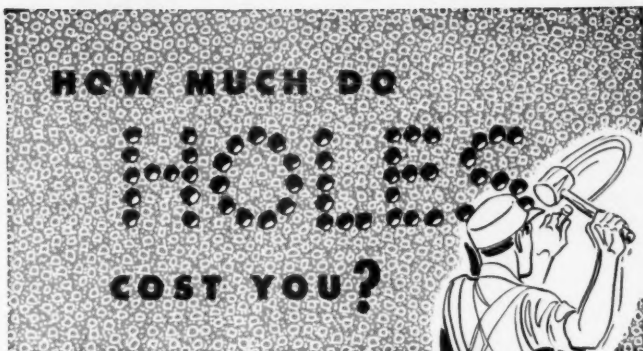
Mitchell Manufacturing Company,  
2525 N. Clybourn Ave., Chicago 14,  
Ill.



**Frame Press (26)**

A standard line of hydraulic presses with movable frames has been designed. Press is provided with a large area table on which the work can be lowered by hoist or crane. Then the frame is moved over the table. The workhead can be moved from side to side along the frame channel, making it easy to center the workhead above the work laterally as well as longitudinally. Provision is made for the workhead to be moved up or down to adjust to the height of the work. Available in standard capacities of 25, 50, 75 and 125 tons. They can be furnished for either electric or air-powered hydraulic operation.

Dake Engine Company, Grand Haven, Mich.



*A* hole has been defined as nothing surrounded by something!

Now if you were asked to pay for "nothing" you'd rightfully refuse. Yet if you are still clinging to the old "dig and drill" method for fastening steel or wood to concrete—YOU ARE PAYING FOR "NOTHING"!



The modern DRIVE-IT method for fastening does away with drilling and boring. A small powder charge provides the "muscle" to "drive" the hardened steel drive-pin. No previous preparation is needed. One split-second and the fastening is made—strong, permanent and *inexpensively*.

The DRIVE-IT fastening method has been fully tested and approved by the Underwriters' Laboratories for efficiency and safety.

Yes, wherever steel or wood must be fastened to concrete or steel, DO IT with DRIVE-IT . . . and save time and money. Write for complete information.

Distributors from Coast to Coast  
**THE POWDER POWER TOOL CORPORATION**

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Cleveland Branch: 2075 E. 65th St., Cleveland, Ohio  
Canadian Distributor: Ammo Power Tool Co., Ltd.,  
Vancouver, B. C.

U. S. Pat. No.  
1,984,117; 3,400,878  
Other patents pending



For heavy  
fastening  
DRIVE-IT  
"400"

For light  
fastening  
DRIVE-IT  
"300"

Approved By  
Underwriters'  
Laboratories

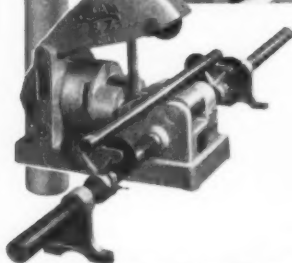
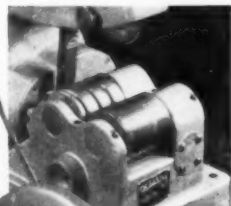


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CONDUIT  
FASTER...  
BETTER...  
*For less!*

## QUIJADA E-Z cutter

Exclusive power driven rollers make the E-Z cutter the fastest on the market. The cutter is always cutting - never slipping. Over 500 cuts to a sharpening... 15 sharpenings to a wheel.

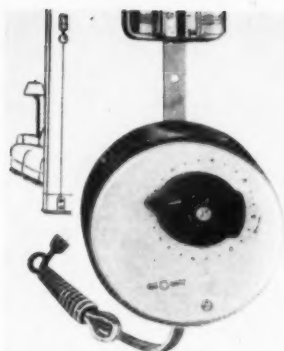
It's portable too! Weighs only 100 pounds. To keep competitive add this time saver to your equipment.



WRITE FOR INFORMATION TO DEPT. EC 12

**QUIJADA TOOL CO., INC.**

5474 ALHAMBRA AVENUE  
LOS ANGELES 32, CALIFORNIA



**Thermostat Control (27)**

Announcement has been made of a new "Heet-O-Matic" day and night thermostat control. It is a combination timer-heater powered by a Telechron fractional horsepower motor, operating from 110 volt ac, 60 cycle wall outlets, through attached 6 ft. cord. All working units are enclosed in a plastic case. It is designed for application to thermostats regulating domestic stoker-fed, gas and oil heating systems.

*Automatic Controls Corporation, Ann Arbor, Mich.*



**Fluorescent Fixture (28)**

Announcement has been made of a new Flolite "Hairpinline" cold cathode fluorescent fixture, Model US-680. Low surface brightness of lamps, 2.5 candles per sq. in., permits use without louvers or globes to shield glare. This six element unit is recommended for larger offices, reception rooms, etc.

Available in soft white, warm white, 3500-degree white, 4500-degree white and daylight.

*Mobeco, Inc., Watertown 72, Mass.*



**Spotlight (29)**

A new incandescent spotlight, known as "Peep Spot" No. 1070RT, has been announced. It features relamping from the top, which is removable without the use of tools. Unit is designed with maximum shielding. Orifices conform to 35° beam spread. Some of the features are: Orifice assembly in one unit; positive spring action snaps orifice assembly fast; rib in housing latches orifice assembly securely; no visible screw heads; plaster frame furnished with machine screw tapped tabs; screw shell heavy duty porcelain socket; standard 4 inch outlet box supplied with plenty of knockouts.

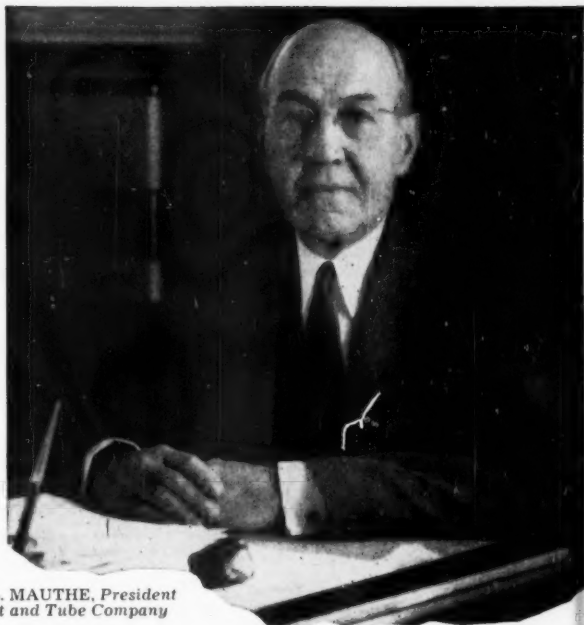
*Neo-Ray Products, Inc., 315 East 22d Street, New York 10, N. Y.*

**Motor Control (30)**

New rain-tight outdoor motor control units are available. Designed for use on irrigation projects, they are applicable to many other outdoor motor control jobs. Units consist of a combination across-the-line starter with circuit breaker in a rain-tight enclosure, with a built-in start-stop push-button or hand-off-auto selector switch. A self-indicating slamproof handle is provided for operation of circuit breaker. Starter and breaker are mounted on a steel panel, permitting removal of complete interior as a unit for replacement or servicing. Mounting brackets at top and bottom of enclosure permit surface mounting, and a 1 1/2 in. threaded hub is provided at top for conduit connections. Designated as Class 11-206-NR, they are available in NEMA sizes 1 through 5. Standard voltages are 220 and 440 volts, 60 cycles, although with proper coils starters are suitable for voltages up to 600 volts.

*Westinghouse Electric Corporation, Pittsburgh 30, Pa.*

# Why is the scrap situation so critical?



*An interview with J. L. MAUTHE, President  
The Youngstown Sheet and Tube Company*

## **Why are you concerned about iron and steel scrap, Mr. Mauthe?**

Our inventories are critically low and the present scrap flow is not sufficient to maintain capacity steel plant operations. Furthermore, if the flow of scrap is not increased, a curtailment of steel production is inevitable.

The industry is using all the pig iron and all the home scrap that is available. The balance of our metallic requirements must be made up through procurement of purchased scrap. Every ton of scrap that we do not get represents a ton of steel that we cannot make.

## **How much scrap does the industry need?**

In 1950, 96,700,000 tons of steel ingots and castings were produced, requiring over 61,000,000 tons of iron and steel scrap.

In 1951, over 65,000,000 tons of scrap will be required, and even more will be needed in 1952.

## **Where does scrap come from?**

About 58% of the total scrap required is produced by the ingot and casting makers, and is known as "home" scrap; the balance of 42% is "purchased" scrap and is procured from outside sources.

Purchased scrap generally falls into two categories: Scrap from current fabrication and that which is the result of obsolescence.

There are three important sources from which we get obsolete scrap, much of which is dormant:-

- 1 - Obsolete machinery and equipment in every industrial plant, at the oil fields and on the farms.
- 2 - Battlefield scrap, obsolete ships and war material, surplus machinery and equipment, which government can make available.
- 3 - Countless old automobiles and trucks, which are rusting away in automobile wrecking yards in every section of the country.

## **What can be done to increase tonnage of purchased scrap?**

This scrap must be made available immediately! All industry and government must awaken to the critical nature of the situation. They must realize that if we do not get the scrap, they will not get the steel!

**YOU CAN HELP - YOU MUST HELP!  
NO SCRAP - NO STEEL**



**The Youngstown Sheet and Tube Company - Youngstown, Ohio**



BUY TODAY • HEAT TOMORROW  
WITH  
**ELECTROMODE**

Cut  
Plant  
Heating  
Costs



## FOR THOSE HARD-TO-HEAT AREAS

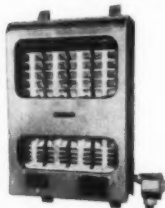
Model 14-10 Suspension type 10,000  
watts. 230/240 volts.

Do you have a heating problem in your plant or office . . . any hard-to-heat area? Electromode heaters are your logical answer.

Here's why . . . Electromode heaters are available in all sizes and capacities from 1500 to 45,000 watts to fit any heating problem. They can be located anywhere that electrical wiring can be strung. Equipped with automatic temperature controls and built-in safety switch, means economy of operation and absolute safety from fire, shock, or burn. The exclusive patented cast-aluminum heating elements will not rust or corrode. Electromodes provide an abundance of fan-circulated heat when and where it is needed. Approved by Underwriters' Laboratories and thousands of commercial and industrial plants throughout the country.

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The only Electric Explosion-Proof Heater of its kind approved by Underwriters' Laboratories. Features Electromode patented cast-aluminum heating element. Specially designed for installation in hazardous areas where heat is required and danger of explosion exists. Available in 2000, 4000, 6000 watt capacities. For full particulars mail coupon below.



Model CX-2 Convection type 2000 watts 240/480 volts.

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- Watchman Houses
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- Garages
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### Impulse Counter

(31)

A newly designed step-motor impulse counter to provide 100% accuracy up to 60 counts per second, has been announced. The device has a counting range which makes it especially useful in high-speed production counting. It may be used in such applications as counting the number of vitamin pills produced by a factory or counting flaws in fabric at process speed. It may also be used in certain types of radiation counting where the use of a direct reading register is desirable. It consists of a step motor with a resetting type register, and a power supply enclosed in a steel case.

General Electric Company, Schenectady 5, N. Y.



### Outlet

(32)

Announcement has been made of a new outlet made especially for electric range connection and industrial applications. Special "Slip Lock" pressure terminals assure permanent connections. Knockouts—combination  $\frac{3}{4}$  inch by 1 inch at one end and at the back. Cable clamp is easy to get at and handy to transfer from the end knockout to the bottom knockout. Listed by Underwriters' Laboratories, 3 wire, 50 amp, 250 volt. Length is  $4\frac{1}{4}$  in., width  $2\frac{1}{2}$  in., depth  $2\frac{1}{4}$  in.

Eagle Electric Mfg. Co., Inc., 23-10  
Bridge Plaza South, Long Island City  
1, N. Y.

### Motor Starter

(33)

A combination across-the-line motor starter with circuit breaker, in which the components are mounted "side-by-side", is available. It has been developed for use where mounting is desired for reasons of space and arrangement. Starter has the same self-indicating slamproof handle as the standard design with vertical-mounting. Starter is available in sizes 0, 1, and 2 in sheet metal enclosures for NEMA Types 1, 1A, and V.

Westinghouse Electric Corporation,  
Pittsburgh 30, Pa.

## Product Briefs

(34) The Millers Falls Company, Greenfield, Mass., has introduced a new line of high-speed, heavy-duty, follow-through type hole **saws** in sizes up to 4½ inches in diameter. . . . (35) Model 243-A Vibroground is a new, direct-reading **meter** for measurement of soil resistivities. It is manufactured by Associated Research, Inc., 3758 W. Belmont Ave., Chicago, 18, Ill. . . . (36) S. C. Johnson & Son, Inc., Racine, Wis. has announced a high-powered **vacuum**, known as Wet-Dry Vac.

(37) Announcement has been made of a new electrical **connector** developed by Salsbury Corporation, 1161 E. Florence Ave., Los Angeles, Calif. . . . (38) Duro-Test Corporation, North Bergen, N. J., has introduced Duroliter, a **fluorescent sign lamp**. . . . (39) A new nylon **safety strap**, known as "Klein-Kord", has been announced by Mathias Klein & Sons, 3200 Belmont Ave., Chicago, Ill.

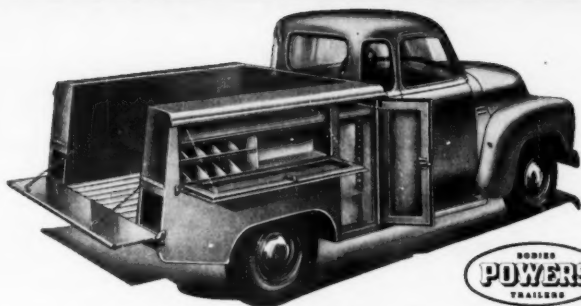
(40) A new Dustkop **dust collector** designed for outside exhaust of cleaned air, available for use on 25 cycle power, has been announced by Agat-Detroit Company, Ann Arbor, Mich. . . . (41) A new portable **drawing board** molded from Bakelite styrene plastic has been introduced by A. Parrick Company, 9 Grove Street, Westwood, N. J. . . . (42) Announcement has been made of a new thermostatically controlled **solder pot** for tinning Formvar wire and long leads by Dee Electric Co., 1101 N. Paulina St., Chicago 22, Ill.

(43) A new electronic insulation **tester** designed for industrial use, made in England, is being distributed by Herman H. Sticht Co., 27 Park Place, New York 7, N. Y. . . . (44) The Hallemite Manufacturing Co., 2446 West 25th St., Cleveland 13, Ohio, has introduced Por-Rok, a quick setting **cement**. . . . (45) Electronic Devices Inc., 429-12th St., Brooklyn, N. Y. has announced a new improved design of molded-in electronic selenium **rectifiers**.

(46) New millivolt-input Freq-O-Tron **telemetering equipment** is available from Westinghouse Electric Corporation, Pittsburgh 30, Pa. . . . (47) A new, revised edition of the Delbridge Social Security and Withholding Tax **Chart** has been announced by Delbridge Calculating Systems, Inc., 2502-10 Sutton Ave., St. Louis 17, Mo.

(48) The Superior Electric Co., Bristol, Conn., has announced Powerstat variable **transformers** for 400/800 cycle operation. Units are available in a multitude of voltage and current ratings in single and polyphase models.

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"the electrician's service body?"

With your present truck you probably spend 15 minutes a day looking for parts or returning to your shop. If your service charge is \$3.50 per hour, you lose \$319.37 yearly.

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1. Removable overhead rack.
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567

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BLOWERS AND  
VACUUM CLEANERS



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MICA UNDERCUTTER FOR  
SLOTTING COMMUTATORS



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Write for 64-page Catalog describing these and many other products for Industrial Maintenance, Safety and Production.  
**MARTINDALE ELECTRIC CO.**  
1309 Third Ave. Cleveland 7, Ohio

# Catalogs, Bulletins and Engineering Data

(49) Motors, including ac, dc, gear-motors, multispeed, are listed and specified by electrical types, polyphase squirrel-cage and wound rotor and single-phase, in 4-page illustrated bulletin. Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.

(50) ELECTRONIC AIR CLEANER is the subject of leaflet SM-5319 which describes the application of the Precipitron home unit in eliminating dust and dirt from the air in residential dwellings. Westinghouse Electric Corp., Sturtevant Div., Hyde Park, Boston 36, Mass.

(51) SWITCHES, Type RP (Rotary Packet), for current ratings of 10, 25, 30, 60, 100, 200 and 500 amperes, at voltages from 115 to 600 volts ac and up to 250 volts dc, are illustrated and described with typical circuit diagrams in 12-page booklet. The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.

(52) CONNECTOR CHART provides convenient selection data on types and sizes of connectors to be used with the various sizes of armored cable, leaded cable, flexible steel conduit, non-metallic sheathed cable and service entrance cable. The Thomas & Betts Co., Inc., 34 Butler St., Elizabeth, N. J.

(53) INSTRUMENT PANELS for convenient mounting of instruments and auxiliary equipment in cabinet type, self-contained units are priced and illustrated in bulletin P1-2, including specifications on the units and the standard cutouts available. Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill.

(54) MAINTENANCE HANDBOOK on commutators and slip rings is a 39-page illustrated volume setting forth procedures and methods for analyzing and correcting commutator, slip ring and brush troubles, including an extensive trouble-cause-remedy chart for handy reference. Ideal Industries, Inc., Park Ave., Sycamore, Ill.

(55) VOLTAGE REGULATORS, Types V-00 and 221, for small ac generators are described and illustrated in 4-page bulletin 14B6143A, including descrip-

tion of construction and operation of the "Rocking Contact" sector and application data. Allis-Chalmers, Milwaukee 1, Wis.

(56) STUD WELDING specifications and stud selection guides are presented in 8-page manual, "How To Design For Stud Welding", with illustrated suggestions for the economical solution of fastening problems. Nelson Stud Welding, Lorain, Ohio.

(57) INDUCTION HEATING equipment for forging, hardening, brazing and annealing applications at 1000, 3000, and 10,000 cycles is the subject of 12-page, two color booklet GEA-5679, explaining construction and application and presenting illustrated procedures. General Electric Co., Schenectady 5, N. Y.

(58) WIRING DEVICES, over 1000 individual devices, are specified and illustrated in 40-page General Catalog No. 51-1952, including about 200 items in the heavy industrial category, with emphasis on Turn-Tyte interlocking devices. Rodale Mfg. Co., Inc., Emmaus, Pa.

(59) LIGHTING FIXTURES for artistic incandescent and fluorescent applications are illustrated in two bulletins showing designs and installations. Edward F. Caldwell & Co., Inc., 101 Park Ave., New York 17, N. Y.

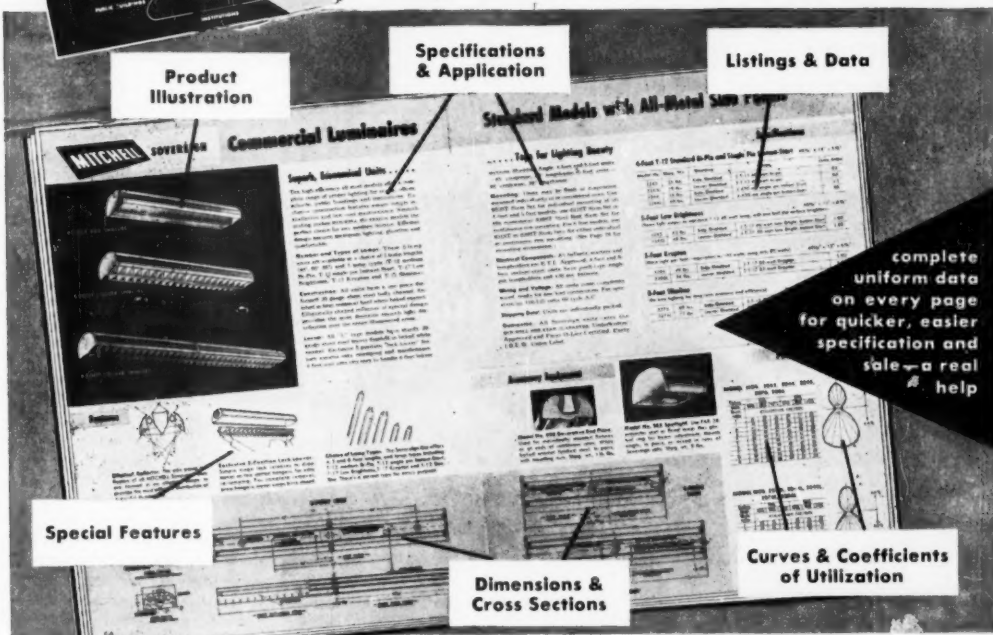
(60) OIL SWITCHES, Type PK, sub-way style, manually operated, for full load break cable sectionalizing, 5000 volt single throw, rated 200, 400, and 600 amperes, are specified and illustrated in 8-page booklet, DC51, describing application and operation of ball and groove high pressure contacts. G & W Electric Specialty Co., 7780 Dante Ave., Chicago 19, Ill.

(61) FLUORESCENT FIXTURES for slim-line lamps with 120, 200, 300 or 430 ma ballasts and for preheat or instant start standard fluorescent lamps with conventional high power ballasts, for any type of installation, are specified and illustrated in 11-page booklet, including louvered ceilings, square and rectangular units and spot light units. Marlow Lights, Inc., Fanwood, N. J.



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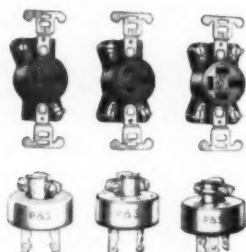
- ☐ Mitchell Commercial Lighting Catalog  
☐ Mitchell "Dynalite" Industrial Lighting Catalog

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(62) **SCHOOL LIGHTING** is the subject of 20-page booklet B-4556-A containing a basic school lighting analysis, complete data and sketches for eight sample layouts, and photographs and descriptions of seven types of luminaires. Westinghouse Electric Corp., Pittsburgh 30, Pa.

(63) **AIR CONDITIONING**, air handling and air cleaning equipment, including unit air conditioners, unit heaters, ventilating equipment, general purpose and industrial fans, water coolers and home air cleaners, is discussed with operation and application data in 16-page catalog B-5164. Westinghouse Electric Corp., Sturtevant Div., Hyde Park, Boston 36, Mass.

(64) **SERVICING MANUAL No. 504** contains 16 pages of case histories in the use of the Amprobe Snap-around Volt Ammeter for locating troubles in electrical systems, with illustrated applications and a summary of the instrument's versatility. Pyramid Instrument Corp., 49 Howard St., New York 13, N. Y.

(65) **INCANDESCENT FIXTURES** of square cross-section, recessed mounted, with hinged frame for easy relamping, Holophane Prismatic Reflector and Controlens supported by frame, are described and illustrated in folder. Day-Brite Lighting, Inc., St. Louis 7, Mo.

(66) **WIRING DEVICES**, including switches, outlets, lampholders, sockets and receptacles, are described, illustrated and specified in 17-page Catalog No. 50; are priced and indexed in supplementary bulletin. Slater Electric & Mfg. Co., Inc., 56th St. and 37th Ave., Woodside, N. Y.

(67) **FIXTURE HANGERS** which allow disconnecting and lowering of lighting units for servicing, in installations where mounting heights make maintenance difficult, are described in Catalog No. 50, with data on a complete line of indoor and outdoor hangers. Thompson Electric Co., 1111-57 Power Ave., Cleveland 14, Ohio.

(68) **COPPER CABLE** savings from the use of high current capacity, Type AVA cable, are discussed with practical examples in folder. Rockbestos Products Corp., New Haven 4, Conn.

(69) **DELAYED ACTION** light switch which allows almost a minute for exit before the tripped switch shuts off the light is illustrated and described with operation and application information in 4-page bulletin. Electric Deodorizer Corp., 9993 Broadstreet, Detroit 4, Mich.



(70) **ELECTRONIC PARTS** catalog is a hard-cover bound, 1100 page book with 7,000 illustrations, listing over 75,000 specified and priced electronic components and units, with emphasis on industrial electronic items for production, research, development and control. Milo Radio & Electronics Corp., 200 Greenwich St., New York 7, N. Y.

(71) **MOTORS**, totally-enclosed, fan-cooled, for use where there is dust, dirt, fly ash, rain, snow or corrosive gases, are specified and illustrated in bulletin 51B7225, including data on construction, operation and application. Allis-Chalmers, Milwaukee 1, Wis.

(72) **ELECTRIC STAIRWAYS**, their component parts, sizes, prices, applications, layouts and maintenance are discussed in 32-page booklet B-4582, including diagrams and photographs of construction, operation and actual installations. Westinghouse Electric Corp., Elevator Div., Jersey City, N. J.

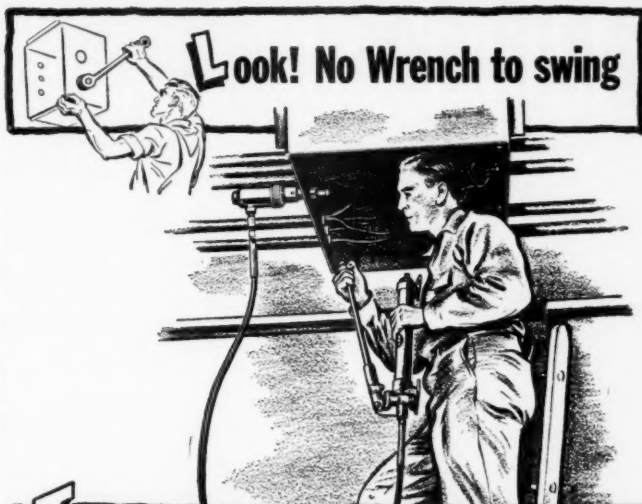
(73) **BEAM LOAD SELECTOR** is a pocket-size, slide-insert device for quickly calculating safe loads on Unistrut sections under varying conditions of span and unbraced height, and for determining number of sections required for a given load. Unistrut Products Co., 1013 W. Washington Blvd., Chicago 7, Ill.

(74) **ELECTRIC TRUCKS**, including pallet, platform, high lift platform, high lift fork and tractor, are described and illustrated in 16-page bulletin P809, presenting operation and application data. The Yale & Towne Mfg. Co., 11,000 Roosevelt Blvd., Philadelphia 15, Pa.

(75) **COMMERCIAL LUMINAIRES** for fluorescent lighting in stores, offices, schools and public buildings are described and illustrated in Catalog 433, including specifications, performance data and installation data. Mitchell Mfg. Co., Chicago 14, Ill.

(76) **SOUND SYSTEM** equipment, including phono-P.A. systems, Belfone inter-com equipment, recording equipment, amplifiers and complete accessories, is described and specified in 20-page catalog. Bell Sound Systems, Columbus 7, Ohio.

(77) **MOTORS**, shaded-pole induction, with single, 2- or 3-speeds are illustrated and described in 10-page bulletin, including mechanical specifications, detailed electrical data for 4 and 6 pole—open or enclosed and 4 and 6 pole fan cooled models, and application data. Marco Industries, Inc., Terrace Blvd., Depew, N. Y.



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Drive knock-out punches with an amazingly low-cost "Porto-Power" hydraulic jack! A few easy strokes on the pump does it! Compare that with the old-fashioned method of a half-hundred knuckle-busting turns on a wrench. With "Porto-Power," you save on every hole punched — workmen are happier, safer — dies last 6 times longer — speed is spectacular! Pays for itself on the first good job!



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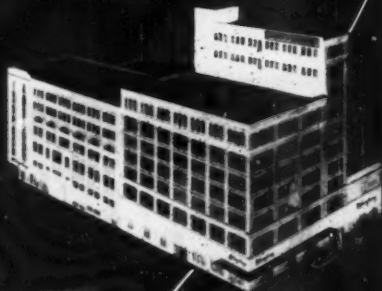
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# Questions on the Code

## Service Overcurrent Protection

**Q.** *We would like an interpretation of the code, paragraph 2371-a, in which is listed exceptions to where overcurrent devices in series with ungrounded service conductors are required. The exception in question is No. 3 which states that an overcurrent device is not required where not more than six circuit breakers or six sets of fuses serve as the overcurrent device. It is our belief that this has reference to small distribution panels which have not more than six branch feeders.—W.A.M.*

**A.** Section 2371, Exception 3 of the Code reads as follows:  
"Not more than six circuit breakers or six sets of fuses may serve as the overcurrent device."

This rule does not limit the application to small distribution panels. Many of the applications of this rule, however, consist of six or less branch circuit breakers mounted in a panel and approved by Underwriters Laboratories for service use.

There is no rule in the Code which would deny the use of say, six separate 400 ampere switch and fuse boxes to act as the main switch and overcurrent protection for the service, provided each 400 ampere switch and fuse assembly is approved for service use.

Another case could be an old installation which is served through a 1200 ampere main switch and fuse. The engineer wishes to install air conditioning which requires about 300 amperes. As far as the Code is concerned, this additional load could be served through a 400 ampere main switch and fuse or circuit breaker without disturbing the 1200 ampere switch.—B.A.McD.

## Service Drops

**Q.** *A large addition has been built to a school building in our city, and the present service to the older building is not adequate to supply the new addition. The plans and specifications call for an additional service to be run to the new addition to supply its electrical installation. Inasmuch as*

*this will constitute two service drops to the building, will this be a violation of the Code requirements?—M.L.L.*

**A.** If the new addition is separated from the old building by a fire wall which has Class A doors on each opening through that wall between the new and old buildings, the property may be considered as two separate buildings in which case Section 2301 of the Code would permit the separate service drop being extended to the new addition. On the other hand, if the new addition is not separated from the old building by a fire wall with all openings properly protected, Section 2301 would prohibit the use of two service drops to this building unless one drop could be used for power and the other drop for light loads. As you will note in the fine print note under this section, different classes of use as referred to in sub-section c. pertain to the needs for different voltage, frequency or phase, or because of rate schedules as in the case of controlled water heater service. Therefore, if your power loads were three phase and your lighting loads single phase, it would be perfectly possible under this section to run to separate service drops to a building provided each drop supplied only a single type of load.—G.R.

## Rubber Mats on Floor At Switchboards

**Q.** *Is it required to have an insulating tile or rug on the bare concrete floor of a substation control room? Should there be an insulating covering on this same concrete floor in the switch room where the operator operates the metal clad 13 kv disconnect switch with a metal crank?—F.R.*

**A.** Section 2623-c of the Code is the only rule I know of that requires rubber mats or other insulating material to be installed on the floor in front of the switchboard and this requirement is limited. The rule reads as follows:

2623-c. On live front switchboards, instruments, meters and relays

(whether operated from current and potential transformers, or connected directly in the circuit) on switchboards having exposed live parts on the front of panels, shall not have their cases grounded. Mats of insulating rubber or other suitable floor insulation shall be provided for the operator if the voltage to ground exceeds 150.

Section 2624 also covers instruments, meters and relays which have current carrying parts operating at more than 750 volts to ground. Reference to this rule shows that no floor insulation is required since the rule satisfies the hazard by insulation, barriers or covers. I know of no other Code requirement which would require insulated flooring in the cases covered by your letter.

If the substation you mention is owned and operated by an Electric Utility, as covered by the introduction of the N. E. Code, the rules of the Code do not apply. It is also true that States and Governmental agencies may have rules on this matter and you should check this with your local authority.—B.A.McD.

## Oil Burner in Garage

**Q.** *We have been asked to wire up an electrically operated oil burner located in the basement of a garage building here in this city. As the basement of this building is utilized for both the storage of automobiles and some body work, we are concerned as to the 4-foot requirement of the National Electrical Code as it would pertain to control equipment used for this burner. If we can locate the burner and its control equipment at least 4 feet above the floor of the basement of this building, will it conform to present Code requirements?—J.A.D.*

**A.** Actually you are confronted with two National Codes inasmuch as the National Building Code prevents the installation of a furnace in the open in a room in which automobiles are stored or worked upon because of the open flame hazard. Then the National Electrical Code, under Section 5102, would prohibit the installation of any ordinary electrical

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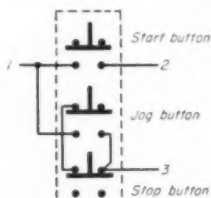
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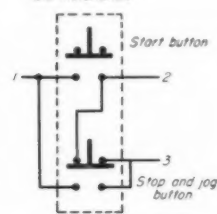
equipment in a basement of a garage building used for the storage of automobiles or for the maintenance work on them unless a portion of the basement was above grade level, as the second sentence of Section 5102 reads as follows: "Where reference is made in this article to a level of 4 feet above the floor, it shall be construed to mean each floor at or above grade level. In the case of floors below grade level, the measurement shall begin not at the floor, but at the bottom of outside doors or other openings at or above grade level." Therefore, even though the basement was reached by an outside ramp, it would be impossible to use any electrical equipment in the basement of an average building used as an automobile garage because the reference is grade level and not openings leading to ramps or window wells. Other standards require that heating plants for buildings of this type, if located below grade, be enclosed within a vapor-tight wall or partition and be accessible only from outside of the building or from an area used as office or display which is cut off from the garage proper by self-closing doors and reasonably tight partition walls.—G.R.

## Motor Pushbutton Control

**Q.** Shown below is a drawing of a pushbutton control installation about which I am in doubt. The control is for a motor starter where jogging the motor is desirable. Does the Code prohibit using a stop button with a set of normally closed and a set of normally open contacts in this manner?



Old Installation



Proposed Installation

Another similar installation uses three buttons, and I wondered if it was essential as a Code requirement.—C. J.

**A.** Insofar as the N. E. Code is concerned, I am unable to find any requirement which covers the points raised in your question concerning pushbutton control. Since the drawings you have submitted do not show the complete circuits, it is difficult to comment. I have endeavored to complete these circuits but with the arrangement you have shown I am unable to understand how you achieve the ends desired.

The question of jogging by pushbutton is handled by the various manufacturers in a manner which is not common to all. I have before me a control catalogue of a large Manufacturer, the Westinghouse Co., who advises that jogging by pushbutton is most frequently accomplished by one of three methods.

A. A three button "Start-Jog-Stop" station. This is similar to your sketch covering the old installation. This method is the most desirable since each button has an independent function. The circuit shown however requires a separate jogging relay and you are cautioned to never use the three button station without this jogging relay.

B. The second method shown consists of a "Start-Stop" station with latch on pushbutton partially depressed while machine is jogged with start button.

C. The third method shown involves the use of a maintained position selector switch.

As already stated the three button station covered by (a) is the most desirable since the starting, the holding and the jogging circuits are independent. The N. E. Code does not rule on any of these methods for jogging a motor and if any of the three methods was used as outlined by the manufacturer, there would be no Code violation.—B.A.McD.

## Lighting Fixtures

**Q.** We recently installed a number of lighting fixtures in an area having an unusually high ceiling making it necessary to extend the usual 3-foot fixture stems with seven feet of tin wall tubing. The circuits supplying these fixtures consisted of No. 12 wire protected with 20 ampere fuses and now the question arises as to whether or not the Code will permit us to use No. 16 fixture wire supplying 300 watt fixtures through the unusually long stems to the outlet boxes where they will be spliced to the No. 12 circuit wires. We have been advised that

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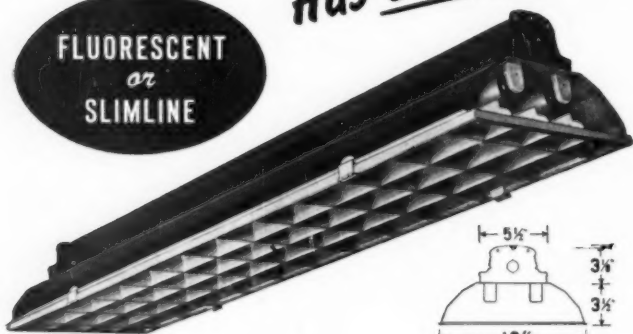
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the Code requires that where taps are taken from a No. 12 circuit, No. 14 conductors shall be used for such taps. Therefore, does the Code consider the wire between the outlet box and the fixture a tap?—S.J.M.

**A.** No, the Code does not consider such a conductor a circuit tap and therefore the lead through this long fixture stem may consist of a fixture wire capable of supplying only the current required by the fixture. In fact, this is the subject of the interpretation No. 365 issued by the Interpretation Committee of the National Electrical Code on November 17, 1950.—G.R.

### Instantaneous Trip Circuit Breakers

**Q.** The 1951 National Electrical Code, Section 4342, second sentence, refers to Table 26 for the rating or setting of motor-branch-circuit overcurrent devices. Table 26 (and most of Table 27) does not list any maximum ratings for circuit-breakers of instantaneous-trip type. This same section allows maximum under adverse condition: of 400% of motor full load current when amounts in Tables are not sufficient.

Question 1. Isn't the reference to 400% intended to apply when other than instantaneous-trip circuit-breakers are used?

Question 2. What section of the Code specifies proper settings of instantaneous-trip circuit breakers when used for motor-branch-circuit overcurrent protection?

Your assistance in clarifying the above will be greatly appreciated.—R.E.S.

**A.** Section 4342 permits branch circuit overcurrent protection as high as 400 % of the motor full load current only when the overcurrent protection given in Tables 26 and 27 are not sufficient for the starting current of the motor. In reply to your first question, I say that the rule applies to both instantaneous and time limit circuit breakers and also fuses. Since Table 26 only covers ac motors, no settings are shown for instantaneous type circuit breakers. This is due to the fact that the ordinary type instantaneous circuit breaker could not be set at the values shown in Table 26 and start an ac motor without opening the circuit. As a result, no values are shown in Table 26 for this type of breaker on ac motors.

Table 27, however, shows that instantaneous type breakers could be used with dc motors and the maximum settings are shown in this Table.

In reply to your second question, there is no Code settings for instantaneous circuit breakers used for motor branch circuit protection except that shown for dc motors covered by Table 27.

The 400% provision permitted by Section 4342 might be used on motor applications that require abnormal time to attain full speed and cannot come up to full speed without causing the breaker to open when set at the values shown for time limit circuit breakers shown in Table 26. Another application of this provision might apply to a band saw located in an open shed of a lumber yard. During the Winter months, on cold mornings, it is often impossible to start an ac motor under such load conditions with any type circuit breaker set in accord with Table 26 without opening the circuit. The correct answer to this motor application, however, would be to require a motor minimum starting current inrush and sufficient torque to handle the job.—B.A.McD.

## Exit Sign

**Q.** We plan to install a number of recessed lighting fixtures indicating exits in a large public building and had planned to use Type T wire to supply the 25 watt lamps contained within each fixture. Now the question has been raised by the local inspector as to whether or not Type T insulation is suitable for use in the temperatures involved in these fixtures, and he claims this is provided for in the present National Electrical Code. However, we have been unable to find any reference to such fixtures under the section devoted to emergency illumination. Does the Code provide for these installations?—M.T.P.

**A.** Section 3102 a. contains the following statement:

"No conductor shall be used under such conditions that its temperature, even when carrying current, will exceed the temperature specified in the table for the type of insulation involved."

Now inasmuch as an exit sign can be expected to be on for a considerable period of time, it is reasonable to assume that unless the fixture is of the ventilated type, it will be rather simple for 25 watt lamps to build up temperature far above 140 degrees Fahrenheit, which is the limiting temperature for Type T insulated wire. Now it is true there are many different types of exit fixtures produced and some of these fixtures are of the self-ventilating type even though they are mounted flush in the wall over or beside exit open-

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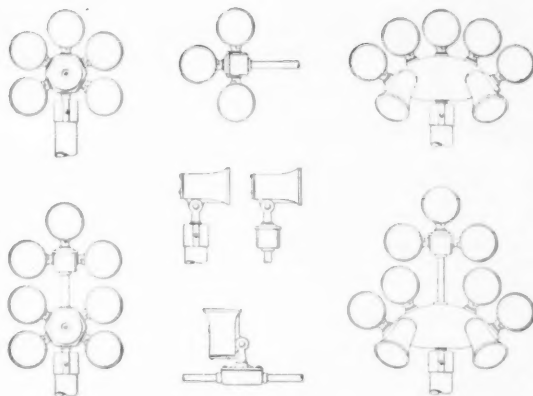


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ings. Furthermore, under Section 4143 of the Code you will find the following statement that fixtures shall be wired with conductors having insulation suitable for the current, voltage, and temperature to which the conductors will be subjected. For flush or recessed fixtures under Section 4179 we find this same requirement, and in addition in sub-section b. of that section you will find the method provided by the Code for safe installations where it is impossible to keep the fixture temperature below the safe operating temperature for any ordinary building wire and that reads as follows:

"Tap connection conductors having an insulation suitable for the temperature encountered shall be run from the fixture terminal connection to an outlet box placed at least one (1) foot from the fixture. Such a tap shall extend for at least four feet but not more than six feet and shall be in a suitable metal raceway."

In other words, it is possible to install a flush or recessed fixture having a removable panel in one side of the fixture enclosure from which one can have access to an outlet box located a foot or more to the side of the fixture. Then by running conduit or electric metallic tubing between the fixture and this outlet box in a round-about method to assure the use of at least four feet raceway, it is possible to use fixture wire, between the fixture through this raceway to the outlet box, having an insulation suitable for the temperatures involved.—G.R.

### Terminal Identification, Polarized Receptacles

**Q.** In Chapter 2, Article 200 a sentence reads "The other terminals need not be marked for identification." Thus: on a 3 wire receptacle one screw is marked "grd" for ground, the second is brass, and the final one copper. Which one is connected for the hot wire?—M.C.Z.

**A.** Section 2008F of the N. E. Code covers requirements for identifying the terminals of three-wire receptacles and caps. Reference to this rule shows that the Code only covers the terminal which may be used for the connection of a grounding conductor and only specifies that such a terminal shall be identified in a manner differing from that specified in Section 2009. Since Section 2009 covers the requirement for identifying the circuit ground conductor terminal it follows that the substantially white color required for this conductor terminal cannot be used for identifying a

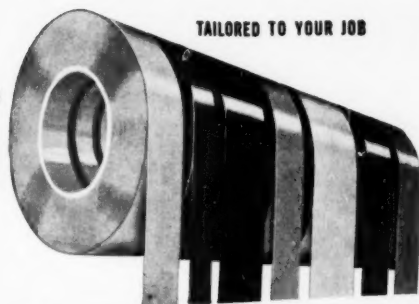
terminal of a three-wire receptacle to be used for the connection of a grounding conductor. In line with this Code requirement, any three-wire receptacle which has one terminal marked "G", "GR" or "Ground", such a terminal is to be used for grounding equipment.

In reply to your question concerning the other two terminals, Section 2008 F does not require any identification of these terminals, and the Code does not specify that the hot wire be connected to either the brass or the copper terminal. As a result, the Code does not answer your question. If one of these two terminals had a white identification, the answer would be simple since the circuit grounded conductor should be attached to such an identified terminal. If on the other hand, the two conductors in question were ungrounded conductors, it would be wrong to connect one of them to a terminal whose identification indicates ground. Since three wire receptacles may be used for the various combinations obtained from 220 volt grounded or ungrounded systems, including three phase or single phase and also the 110 volt combinations it appears impracticable to endeavor to obtain proper terminal identification for each application. The one great advance which the manufacturers have promoted in the past few years to improve the situation is the three wire receptacle rated at 15 A-125 V. The terminal on this receptacle marked "gr" has a horse shoe shaped recess, so designed that it would be impossible to insert this terminal of the cap into a live slot. The other two terminals are identified for connection of the grounded circuit conductor and the live conductor. I believe on the application you have in mind, this is the type of receptacle which should be used.—B.A.McD.



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# Reader's Quiz

## Generator Reverses Current

**QUESTION A19**—Our public school system has the Johnson Uni-vent heating and ventilating system in it. The small one-sixth hp motors which run the individual blowers at each radiator are dc and receive their power from a motor-generator set. Four or five years ago the dc generator reversed its current or lost its permanent field several times within a month and each time we would get it started by hooking a car storage battery in the field winding with the motor-generator set running and it would pick up enough field to run O.K. Sometimes it would be gone again after the next overnight shut down and then again it would not bother for a week or so. By testing we could find nothing wrong with the winding or wiring anywhere. After a few weeks of this it ran O.K. and has for several years until recently it started acting the same. We repeated the battery hook up in the field and it takes off O.K. The method of operating the system has been exactly the same for the past 20 years.

Has anyone had any such experience or a solution as to the cause or remedy for the trouble?—H.C.H.

**ANSWER TO A19**—There are several reasons why your generator loses its residual magnetism or reversal of current. I presume the M-G set is driven by semi-direct coupling where machine can float, at will and separately, whereby the generator has too much of the float to cause pounding at the end bell at one end and pound back to the coupling. If this pounding occurs, there may be a chance that you lose the residual.

There is the thought also that you shut down the unit in a wrong manner. However, this procedure must be used. When shutting down, you must first open the load switch on the generator—then open service switch to the motor. When starting the operation reversed—you close service switch and depress the starting button on the motor—then you close the generator load switch. By shutting down as indicated, the last revolution of the generator has the means to put the last magnetic flux into the generator field coils.

Having complied with the starting and shutting down program, and the

residual magnetism is lost you will have to look further, and you might as well look for a shorted field coil, it may be grounded. If either, the adjacent two coils are so strong that they affect the coil (which is shorted or defective) with their magnetism that when the generator is started the current is reverse and therefore, no generation of current.

However, if there is no ground or shorted coils (field coils) you might try to retard the brush rigging about one-thirty second of an inch, enough so that the neutral plane is not disturbed. When retarding the brush rigging pull the brushes in backward direction (against the direction of rotation)—O.C.

## Battery Charger

**QUESTION B19**—Could any of your readers suggest how we could make up a trickle charger to charge a 6 volt storage battery that is used in laboratory work? We would need about 3 amperes of charging current and it seems like the early radio experimenters used to make such chargers out of material that was handy.

—W.P.R.

**ANSWER TO B19**—A 3 amp trickle charger for a 6 volt battery can be made from a 12 volt transformer, fuse, rectifier, ammeter, and rheostat all connected in series with the battery. The ohmic value of the rheostat would depend on the type of battery to be charged and the charging rate desired. For the conditions given, a three ohm rheostat would be about right and of course all equipment should have a rating of 3 amperes.

Before charging, see that the solution in the battery is at the proper level. Charging a battery creates heat so the battery should be charged in a well ventilated place. The temperature of the solution in the battery should not exceed 110°F during charge. Manufacturers furnish instructions for charging their batteries and these instructions should be followed carefully so as not to injure the battery.—J.H.C.

**ANSWER TO B19**—A simple charger can be made by using a signalling or other low voltage transformer, a dry disc rectifier, and a rheostat.

The transformer should be able to

put out about 3 amps at 6 volts or slightly over. The rectifier, if necessary, can be built up of any type that is readily available—connecting several plates in parallel if necessary to prevent overloading. The rheostat can be used to take care of changing the charging rate and allowing for rectifier aging or voltage variation. The current rating and resistance of the rheostat depends upon whether it is used on the 110 or low voltage side of the transformer. For a rough approximation, the resistance of the rheostat must be great enough so that the voltage drop in it will limit the ac voltage at the rectifier to about 6 volts.—P.S.

## Dry Type Transformer

**QUESTION C19**—What would cause a 480 volt dry type transformer to burn out? This transformer was used to furnish 110 volts for a power saw, and had been in constant use for a month. Source of current is a three phase alternator (transformer was a 3 kva with primary fused at 5 amps).—E.S.H.

**ANSWER TO C19**—Full load primary current on a 480 volt, three phase, three kva transformer is roughly  $3\frac{1}{2}$  amps, and since most transformers will stand a 50% overload, a 5 amp primary fuse should provide plenty of protection. So, since it's not likely that a normal overload caused ESH's transformer to burn out, he might check the following:

a) Actual current required by the motor. If the full load primary current is 4 or  $4\frac{1}{2}$  amps it might eventually build up enough heat within the transformer to char the insulation, yet the fuse would not blow. This is especially likely if ventilation of the transformer is poor.

b) Duty cycle of the motor. Frequent starting means frequent, high starting currents, which could eventually build up sufficient heat to burn the insulation. If the motor starts and stops infrequently, forget this. But if it cycles every four or five minutes, look for transformer heating.

c) Ventilation and location of the transformer. Dry type transformers are especially sensitive to heat, and should be located where there is good natural air circulation. If the trans-

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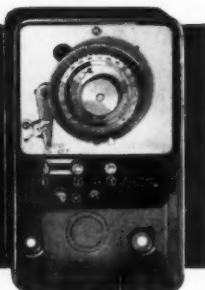
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former must be located in a cabinet or hot spot, make provisions for a fan or exhaust blower to carry heat away from the windings. Heat does more to age insulation than any other single cause.

E.S.H. would do well to check with the transformer manufacturer to be sure the model he has is suitable for the service. Some transformers are designed for intermittent or non-inductive loads, and are not suitable for uses other than those specified. A reliable electrical manufacturer will usually do his best to stand behind his product, and is always ready to assist in unusual applications.—D.H.N.

## Fire Alarm Circuit

**QUESTION D19**—We have a fire alarm (series) circuit consisting of many thousands of feet of No. 14 AWG wire in a large series loop with a line supply of 55 volts direct current. Now I would like to insert some type of signal into this loop to indicate an alarm when an open occurs anywhere in the wiring of this series loop, or is there any other way of solving this problem?—E.J.K.

**ANSWER TO D19**—Insert a circuit opening relay in the series line. This relay will keep its contacts open as long as the series circuit is closed, if this circuit should be opened the relay will close its contacts completing the signal circuit and giving an alarm.

The signal may be either a light or a bell operated by a local circuit either 110 volts or a battery, or both a bell and a light.

The winding of the relay would have to be designed to operate on your series circuit and would take into account the resistance of the series circuit and the current flowing. Unless you have someone who understands the design of relays I would recommend contacting some company who manufactures relays giving them the total number of feet of No. 14 wire and a list of all equipment in the circuit including the Cat. numbers.—A.E.T.

**ANSWER TO D19**—In the 55 volt, dc circuit, install a small series type relay similar to the Type HGA made by General Electric, or those made by the Allied Control Company, 2 East End Avenue, New York 21, N. Y., or the Struthers-Dunn Company, 1321 Arch St., Philadelphia 7, Pa.

The current rating for the coil of the relay should be slightly more than the current now drawn by the series circuit.

These relays may be purchased with normally open and normally closed contacts in various combinations. For

this use, a set of contacts which are held open when the circuit is energized should be chosen. When the series circuit is broken, these contacts will close to operate an alarm circuit.

The contacts are electrically separate from the coil and therefore may be used to operate any type of alarm circuit, either ac or dc.—W.E.N.

## Wiring for Cold Storage Buildings

**QUESTION E19**—Which type of wiring is considered the best to install in cold storage buildings? There is considerable objection to wiring in conduit due to the conduit rusting on the inside which results in the failure of the wiring in a short time, and also makes it impossible to pull out old wiring when rewiring becomes necessary. If conduit is used should openings in the system be provided for drainage?—L.E.P.

**ANSWER TO E19**—There are two types of wiring that will give good service in cold storage buildings: (1) Non-metallic waterproof wiring; and (2) brass conduit.

Non-metallic waterproof wiring is approved for use in excessively moist atmospheres such as cold storage warehouses, if the voltage does not exceed 150 volts to ground and 300 volts between conductors. Approved rubber sheathed cable not smaller than No. 12 must be used, such as Type S cord or Neoprene jacket cord. The cable must be supported every 3 feet with suitable cable hangers and attached to cast metal fittings or to insulated fittings, such as porcelain, with moisture proof seals designed for the purpose. These seals must be used also when passing through walls to prevent the passage of air from a hot atmosphere to a cold atmosphere. This is done by placing a conduit nipple through the wall with a coupling on the outer side into which the seal is placed. If cast metal boxes and fittings are used instead of the insulated type, a green ground wire must be provided in the cable in addition to the circuit conductors for the purpose of case grounding all fittings and boxes.

If brass conduit is selected as the wiring method, it is, of course, installed exactly in the same manner as rigid steel conduit. Be sure to seal this conduit in each place where it enters the cold storage room to prevent condensation. The conduit should be mounted in such a manner as to provide a small air space between it and the mounting surface and arranged drain.—W.R.S.

**ANSWER TO E19**—Article 340 of

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the National Electrical Code provides for the use of type S cord in cold storage buildings. Conductors should not be smaller than No. 12 and boxes should be of cast iron such as the type FS box. Fittings, lampholders, etc., should be of the waterproof type approved for such use.

If a conduit is used, Section 3015 of the NEC covers the installation. In addition all low points in long runs of conduit should have holes drilled for drainage. Wires in conduit should be type TW or RW.—J.H.C.

## Fluorescent Lamps

**QUESTION F19—**What effect do voltage fluctuations and poor voltage regulation have on the performance and life of fluorescent lamps?—D.H.N.

**ANSWER TO F19—**Poor voltage regulation has definite adverse effects on fluorescent lamps. Fluorescent lamps, with their auxiliary equipment, are designed to operate on standard voltages and are so marked. Allowable and practical variations can be tolerated, such as plus or minus 5%; however, either too low or high over normal have their adverse effects.

If operated on voltages too high, the current can become excessive and the auxiliary equipment will run too hot which effects not only the efficiency of said equipment, but also its life. This condition can also cause premature lamp failure. Actually, it has been shown that the overall efficiency decreases as the line voltage increases above normal.

We don't generally get an over-voltage condition, and when we do, it is often caused by too much applied power factor corrective apparatus connected to line at one time.

Where lower than standard voltage is encountered, the current may be too low for satisfactory lamp "preheating." The direct result would be unreliable starting with resulting shortening of lamp life. A similar effect would be met with on instant start lamps—that is unreliable starting as these lamps require an extra voltage "punch" to get going. Any undervoltage causes a decrease of light output for all sources of illumination.

Undervoltage is the common system complaint.—E.A.M.

**ANSWER TO F19—**Voltage fluctuation and poor voltage regulation is greatly undesirable in fluorescent light operation because both conditions reduce lamp life and lumen output.

Overvoltage causes operating current to become abnormally high, overheat the ballast and cause lamp blackening which results in short lamp life.

Undervoltage lowers the preheat current to a point where the electron emission is too low for a proper arc, and as a result the lamp will flash frequently during the starting cycle, and cause electron emissive material to wear away too rapidly, thereby shortening lamp life.—J.G.

## Can you ANSWER these QUESTIONS?

**QUESTION Z19**—What is the best method for determining the A, B and C phases of a three wire, three phase circuit when you are at a panel on the tenth floor of a building and there is no identification at this panel? The service coming into the building is the only point at which the phases are known.—F.J.D.

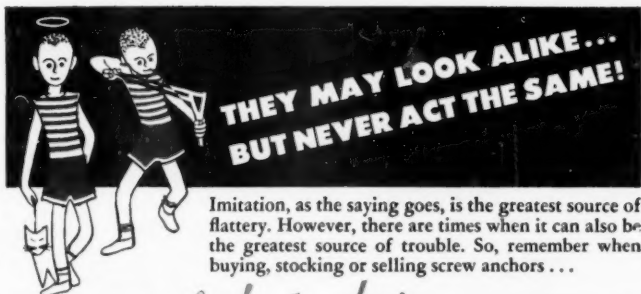
**QUESTION A20**—I have heard several competent electricians discuss the question "should a safety switch be used without a starter for motor control on three phase systems?" Some say it is all right as long as the horsepower rating of the switch has not been exceeded. Some say it should never be done at all. Which is correct and why?—M.D.

**QUESTION B20**—Which motor delivers more power—a  $\frac{1}{2}$  hp, 1750 rpm with a six inch circumference pulley, or a  $\frac{1}{2}$  hp, 3500 rpm with a three inch circumference pulley? Motors are identical except for rpm.—E. S. H.

**QUESTION C20**—We are using a 3 phase, 440 volt, three wire distribution system fed from a star connected transformer with an ungrounded neutral. Can some reader tell us how to make up a ground indicating system for this plant? We have in mind a set of incandescent lamps.—W.P.R.

**QUESTION D20**—A question that is rather puzzling is this. Clutches are advised for ac motors yet in one instance we were advised that a clutch would be of no use as the torque would be too great. The installation originally called for a 5 hp motor, but when this would not work, we suggested a clutch. However the decision was taken to alter the motor to a 15 hp rather than a 5 hp motor with a clutch and we would like an explanation.—H.H.S.

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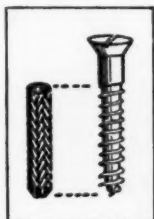
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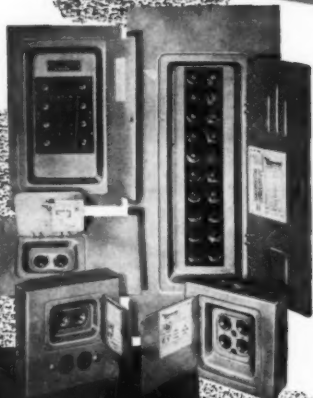


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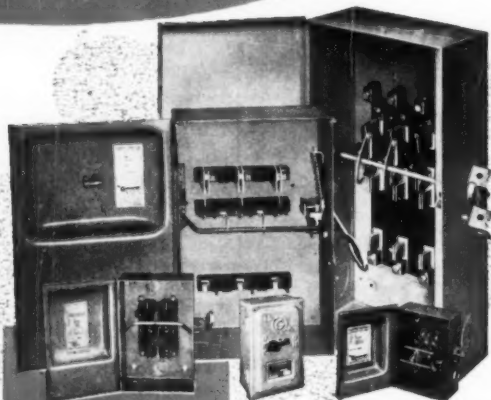




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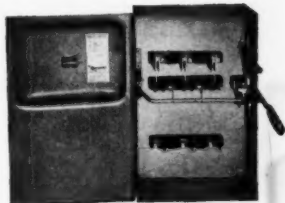
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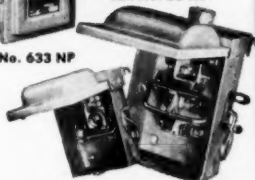
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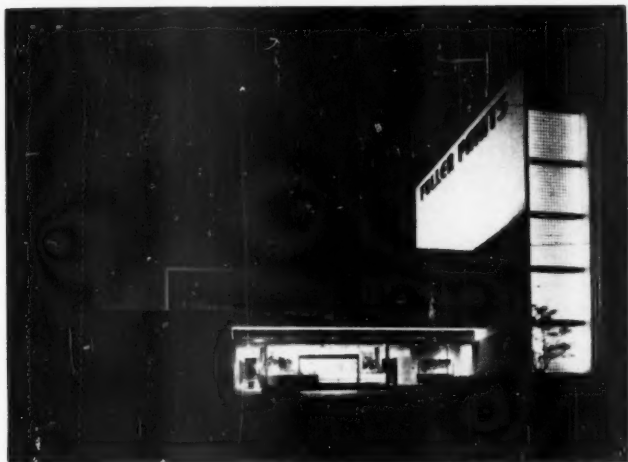
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# Modern Lighting



**LARGE SURFACES** of light, glass and color distinguish the exterior of the W. P. Fuller Paint Company's new administration building in Los Angeles. Floodlighting and backlighting are used to effectively illuminate the central structural pylon, glass-block shaft and silhouetted entrance sign.

## Store Front Combines Light With Color

The W. P. Fuller Paint Company's new southern California headquarters in Los Angeles effectively uses light to dramatize their three products: paint, glass and wallpaper. These products, combined with structural brick and steel, are featured in a building plan which emphasizes flexibility, good merchandising and efficiency. Little doubt exists as to the company's business, for visitors are immediately impressed with the utilization of color (lots of it), glass (broad show windows and tall pylon) and wallpaper (promoting pattern and design throughout the new building). And, matching the judicious use of color, associate architects Adrian Wilson and Alden Becker have used a wide variety of light treatments.

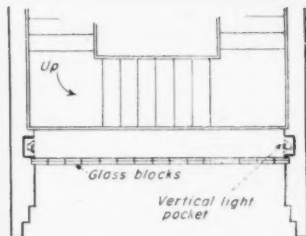
Throughout the 26-building plant, interior lighting is planned in accordance with functions of the several areas: louverall ceilings and recessed downlights in offices and the reception room, vaporproof units in manufacturing and laboratory areas, open incandescent and fluorescent reflectors in storage and warehouse sections, local lighting for close inspection, etc.

Floodlights are positioned behind the parapet on the main roof of the administration building, 24 feet from the face

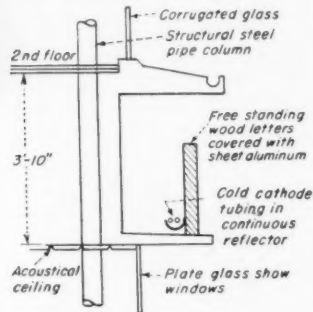
of the pylon and placed 4 feet apart. The floodlights are S&M 1605ST units, four in number, lamped with 500-watt bulbs and operated by a time clock set to turn lights on at 6:00 p.m. and off at 11 each night. With dark green letters on a light tan background, the pylon sign stands out clearly on the floodlighted wall.

Lighting of the glass-block pylon front wall is accomplished by continuous rows of T8 fluorescent 96-inch lamps operated at 200 milliamps. These lamps are contained in 2-lamp industrial-type reflectors, recessed into vertical light pockets set on either side of the interior glass surface. A similar light pocket extends across the top of the glass-block wall, equalizing the over-all brightness of the upper section. The glass-blocks were especially constructed with Fiberglas mats positioned midway between the exterior surfaces. These Fiberglas filters serve as a diffusing medium and insulation blanket as well, reducing lamp glare from within at night and sun glare from without during the day. Horizontal T-beams at each floor level are painted ice-blue to blend with the cool tones of the glass blocks and fluorescent backlight.

The free-standing sign reading



**VERTICAL LIGHT POCKETS** flank the glass block panels in the stairway tower. Fiberglas membranes in the blocks serve as diffusing as well as insulating mediums. Cross-lighting and diffusion result in even, glareless illumination.



**ALUMINUM COVERED LETTERS** spell out the company name above the all-glass entranceway. Twin rows of cold cathode tubing, set behind and at the base of the letters, silhouette the sign and highlight the canopy and backing wall.

"W. P. Fuller & Co" over the Herculite doors is set into the all-glass Solex show-window front. Letters in the sign are sheet-aluminum-covered wood, while backlighting is provided by two rows of 1/2-inch cold cathode tubing with 6-inch spacing between them. This light silhouettes the letters and illuminates the backing wall and protecting canopy. Letters, like those in the pylon sign, are dark green, while the under side of the canopy is white.

The design of this installation demonstrates the need for careful distribution of light sources to afford easy access to all units. Maintenance is an important factor in a design of such wide scope.

The over-all effect of this installation, installed by electrical contractor George L. Patterson of Los Angeles, is modern and attractive.

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Adds hours to lamp life by ending your worst lamp headaches. All-weather seal fits all lamps—long or short, PAR-38 or R-40—assures maximum lamp cooling and faster heat dissipation. Cushion-Seal includes high-temperature silicone rubber with pressed asbestos sheet barrier and aluminum sheet lock. Weatherproof cast aluminum throughout.



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CANDLEPOWER  
for only  
300 WATTS

Stonco Super Spot No. 56 is the most powerful 300W sealed-beam spotlight ever made. Long-range, oval-shaped beam can be rotated to exact fixed position desired. Available with all standard mountings. Weatherproof cast aluminum throughout.

### STONCO ISLAND AREA LIGHT

Porcelain-enamel, heavy steel reflector with built-in cast aluminum bonnet already tapped for 1 to 5 lamp holders—no accessories needed. Removable cast aluminum front cover plate and hollow double-arm yoke saves an hour's wiring time per unit. Write Stonco Electric Products Co., 485 Henry Street, Elizabeth 4, New Jersey.



**STONCO**

## Illusion of Space In Windowless Office

The secretarial anteroom for officers of the Fidelity Trust Company of Pittsburgh is a windowless office, measuring approximately 20- by 40-feet and having a ceiling height slightly less than 12 feet. Ordinarily, such a confined space would produce a feeling far different from one of airy openness and bright expansiveness. Yet clever analysis and excellent cooperation between bank officials, utility lighting engineers, architects, builder and electrical contractor resulted in the creation of a colorful, cheerful room, suggestive more of an outdoor patio than the center of a busy banking institution in a crowded city.

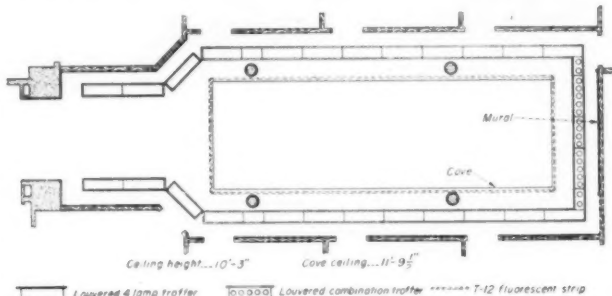
The outstanding feature in the room is the mural which faces entering visitors, for it is a striking, colorful, life-size rendition by muralist Malcolm Parcell depicting the pioneering heritage of America. This mural called for



**LOUVERED TROFFER** over mural contains two rows of T-12 40-watt 4500-degree white lamps and, in each 4-foot section, series of five Pittsburgh Perma-reflectors to provide even asymmetric distribution of light. Lifelike rendition of color and detail is impressive.



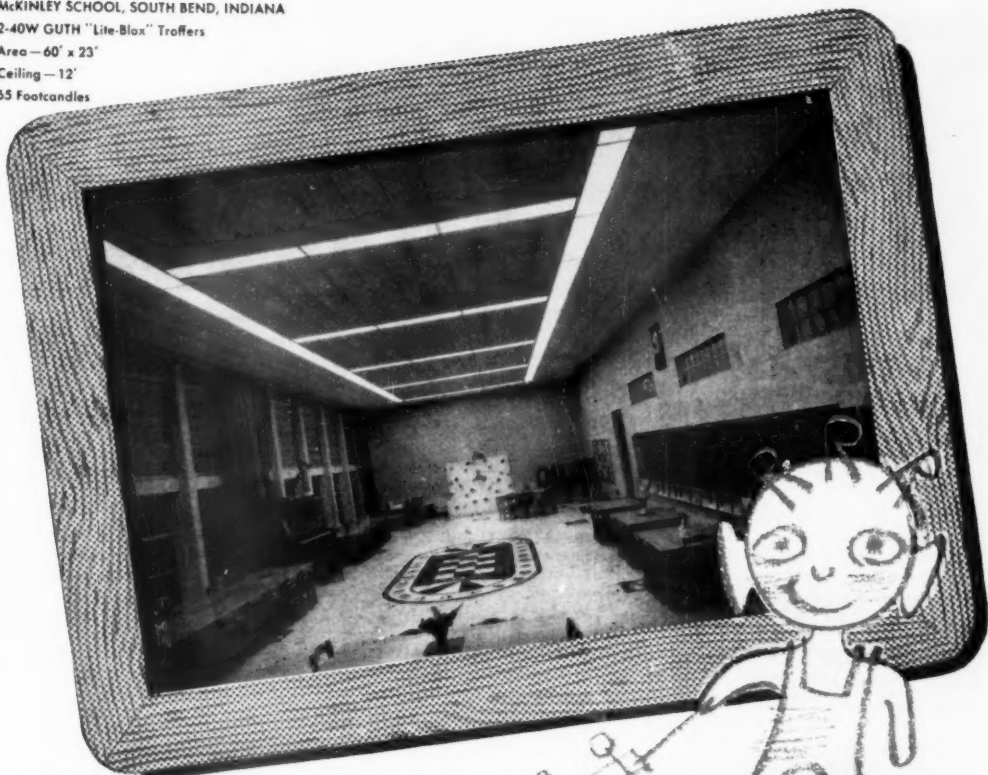
**SECRETARIAL ANTEROOM** in Pittsburgh's Fidelity Trust Company, is generally illuminated by a central cove and a bordering troffer installation. Special lighting was designed for the colorful mural on the wall facing the main entrance.



**WINDOWLESS AREA** measures approximately 20- by 40-feet, yet the architectural, lighting and decorative treatments create an illusion of vastness and restful brightness. Lighting was installed by the Levinson Electric Company; designed by Pittsburgh Reflector.



McKINLEY SCHOOL, SOUTH BEND, INDIANA  
2-40W GUTH "Lite-Blax" Troffers  
Area — 60' x 23'  
Ceiling — 12'  
65 Footcandles



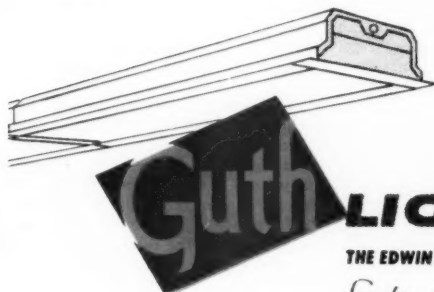
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**R**ugged construction

**R**eliable performance



In classrooms from kindergarten to college, GUTH fixtures are made to solve the toughest lighting problems. They combine the finest illumination for modern education with important economy in purchase, installation and maintenance.

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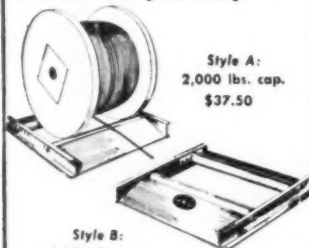


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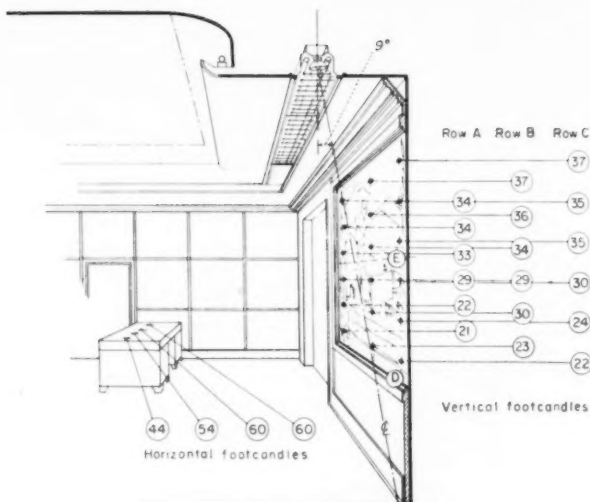
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**COMBINATION FIXTURE**, housing fluorescent and asymmetric incandescent assemblies, achieves even distribution on vertical surface of mural ranging from 21- to 37-footcandles. Cove and troffer installations deliver from 44- to 60-footcandles to secretaries' desks.

special illumination to bring out the true colors of the painting and the details of the work, demanding the special creation of a fluorescent and incandescent troffer combining two T-12 40-watt 4500-degree white lamps and five Pittsburgh Permafectors mounted on the face of the reflector and within the troffer so that the asymmetric distribution of these units evenly illuminates the entire surface of the mural. The evenness which resulted is evident from the footcandle readings on the vertical canvas, for the variation is from 37 at the top to 21 at the bottom corners.

In order to add loftiness to the central area which is panelled to the ceiling with blocks of natural-finish wood and carpeted by a grey-green covering,

a large cove was created in the ceiling, plastered and painted white, then fitted with a continuous row of T-12 fluorescent strips mounted end-to-end. For down light over the various secretarial desks, a perimeter of 4-lamp louvered troffers was also created, the combination of troffer and cove lighting resulting in intensities of from 44- to 60-footcandles on the desk surfaces.

Responsible for the installation are Charles M. and Edward Stotz, architect and engineer; J. S. Frizzell and H. D. Siler, illuminating and sales engineers for the Pittsburgh Reflector Company; the Levinson Electric Company, electrical contractor, and the Commercial Engineering Department of the Duquesne Light Company of Pittsburgh.

## Artistic Lighting Design—a Sales Stimulus

Strong sales appeal is accomplished by the lighting design at Barton's Bonbonniere, Newark, N. J. The clean geometry of interior structural elements, in addition to its own attractiveness, affords an artistic distribution of lighting units.

The predominant element in this installation is a latticework canopy suspended from the ceiling above the length of the main counter. The upper side of this canopy conceals 30—2 lamp, 40-watt, fluorescent fixtures, recessed in the hollow cross-members and directed upward toward the ceiling and backward toward wall display niches. Additional lighting for the sales area

is provided through the lattice openings from 28 Neo Ray recessed square luminaires, ceiling-mounted above each opening and equipped with 150-watt, incandescent inside-frosted lamps and prismatic lens square units.

The striking appearance of the latticework canopy is relieved by the blended effect of display and general area lighting. A line of five 40-watt fluorescent lamps is concealed by the lower frame of the wall display niches and provides light to the wrapping counter below the display niches. At the base of the display counters, specially items are shown to advantage in 3—72-inch, T-6 slimline, and 3—18-

# "Costs CUT 44%"

*with Westinghouse MERCURY lighting*

A typical customer's problem: "To provide high illumination levels at a reduced operating cost."

Westinghouse recommendation: "To change from incandescent to Westinghouse Mercury Lighting."

Results: "36 fewer fixtures to maintain; 216 fewer lamps to replace; a total reduction of 44 % in annual operating cost."

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for More Jobs  
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DEPENDABLE

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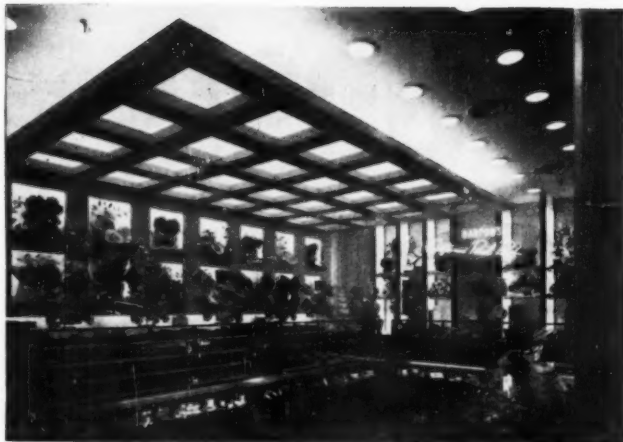
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**DECORATIVE LIGHTING** integrates interior design and light control; accents modernistic store display.

inch, 15-watt T-8 fluorescent show case units. And adding to the geometric lighting theme are the end wall display shelves, 8 bold vertical luminous panels, each equipped with 4-single light, 40-watt, fluorescent lamps and 2-single light, 20-watt, fluorescent lamps. Circular, recessed incandescent units are used to relieve the monotony of the line and angle severity of the general appearance. Two rows of these circular

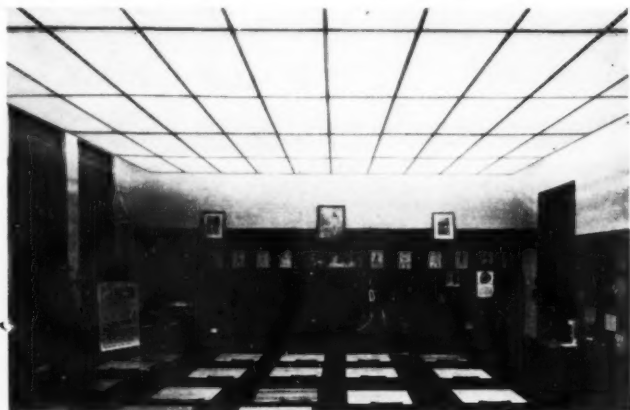
lensed units produce comfortable illumination on the customer floor space not served by the latticework canopy.

Lighting levels achieved by this design are excellent for the purposes served. On the top of the main counter, below the canopy, the level is 91 footcandles. Readings indicate 73 footcandles on the top of the side counter and 50 footcandles on lower counter.

## Classroom Exceeds 100-ft-c. Light Level

A good example of modern classroom lighting is found in the Roosevelt School, Park Ridge, Illinois, where initial lighting levels on desks tops are 110 footcandles. The classroom having a northern exposure, is painted a light warm yellow on side walls, white on the ceiling behind the lamps, and bleached maple for desk tops.

Panelex units entirely cover the ceiling area, while T8 8-foot white slimline lamps are operated at 300-ma. The connected lighting load is 3.6 watts per square foot and louver brightness is 80 footlamberts. The installation was planned by L. C. Haskell of the Northbrook (Illinois) Public Service Company.

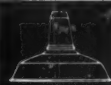



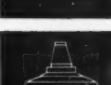
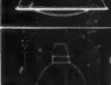


**LOUVERALL CEILING** in Illinois school shields slimline lamps operating at 300 milliamps and delivering 110-footcandles of general lighting to desk tops.





these  
**RLM** lighting  
units...

## INCANDESCENT

Lamp Used

	RIM PORCELAIN ENAMEL DOME REFLECTORS Specification No. 1	
	RIM PORCELAIN ENAMEL DEEP BOWL REFLECTORS Specification No. 2	100-w 150-w 200-w 300-500-w 750-1500-w
	RIM PORCELAIN ENAMEL SYMMETRICAL ANGLE REFLECTORS Specification No. 3	
	RIM HIGH-MOUNTING PORCELAIN ENAMEL REFLECTORS Specification No. 4	300-1500-w Gen'l Service Incandescent 400-w Mercury
	RIM PORCELAIN ENAMEL GLASSTEEL DIFFUSERS Specification No. 18	200-w 300-500-w 750-1000-w
	RIM HIGH-MOUNTING ALUMINUM REFLECTORS Specification No. 40	300-1500-w Gen'l Service Incandescent 400-w Mercury

## FLUORESCENT

	Spec. No.	Length of Unit	Lamps Used*
	9	48"	40-w or 38-w
	11	60"	40-w, 85-w or 100-w T17
	23	48" (shield)	40-w or 38-w
	28	72"	58-w T12
	30	96"	75-w T12
	10	48"	40-w or 38-w
	29	72"	58-w T12
	31	96"	75-w T12
	5	48"	40-w or 38-w
	7	60"	40-w, 85-w or 100-w T17
	22	48" (shield)	40-w or 38-w
	6	48"	40-w or 38-w

\*black numbers are General Service, red numbers are Slimline Lamps

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Shown here is a chart, listing the 34 different industrial lighting units for which the RLM Standards Institute has established specifications covering construction, finish, reflector design, ballasts and uniform quality. The Institute is currently engaged in the development of new specifications and revision of present standards in its effort to keep abreast of the latest advancements in illum-

inating engineering. To make certain of lighting performance that is the kind needed for defense production, specify lighting units certified to conform to RLM Standards of Quality.

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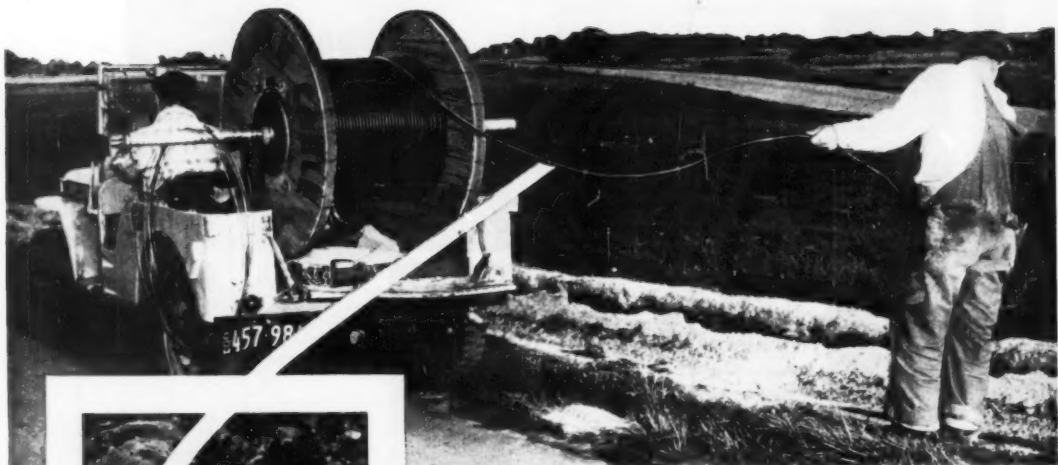
CONFORMANCE to the ESSENTIALS of DEFENSE PRODUCTION LIGHTING is Assured when you specify RLM-LABELED Lighting Units: High diffusion with high reflection factor • Top-quality porcelain-enameled reflectors • Approved reflector design • High power factor ballasts • Uniform quality of materials and construction • Conformance to National Electrical Code

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# RoMarine - RoPrene®



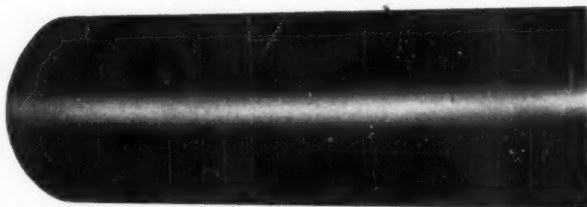
RoMarine-RoPrene All-Purpose Power Cable goes to work at Hancock Field (Syracuse Airport), Syracuse, N. Y.  
Electrical Contractor: Krause & Heil, Inc., Syracuse, N. Y.



RoMarine-RoPrene can be buried direct in earth. Junctions and splices are simple and fast.



Base for Runway Border Light—RoMarine-RoPrene can be terminated quickly and easily with simple manual connections as shown.



**RoMarine-RoPrene, Style RR, was first to be approved by Civil Aeronautics Administration as Type A Insulation for Airport Wiring Under Specification L-824.**

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# All-Purpose Power Cable

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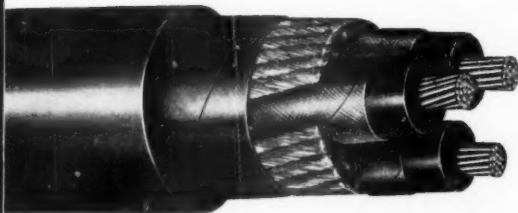
When it comes to airport wiring, secondary network circuits and plant power distribution, more and more electrical contractors are standardizing on RoMarine-RoPrene all-purpose Power cable. Why? Because "all-purpose" means just that. RoMarine-RoPrene is one cable that can be used three ways . . . installed direct in earth, in racks and conduits, aerially—or in circuits combining all three. The result? Important savings

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**1** the latest advancement for  
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**"SPRINGLOX"**  
cuts maintenance costs two ways.

- speeds maintenance
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You get the maximum lighting efficiency out of the T12 lamp *PLUS* all the maintenance advancements of "Springlox" lampholders... that's the *exclusive combination* of Benjamin "Magna-Flo"! Only with "Magna-Flo" can you get *BOTH* in one unit... and you get both at *no extra cost!*

Send for **FREE** "Magna-Flo" bulletin; contains complete data on this high efficiency unit with the *exclusive Benjamin Combination!*  
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"Springlox" lampholders are standard equipment with all "Magna-Flo" units, which are available in open or closed-end reflector styles; for 2 or 3 lamps: 48", 72" or 96" long; in individual units or continuous lines.

# Industrial Electrification

## Where to find Helpful Information

Add these reference books to our recommendations of last month. They discuss motors and generators, motor repair practices and wiring diagrams, maintenance hints, electronics, illumination and industrial heating.

**Direct Current Motor Manual:** H. S. Dusenbury, electrical engineer, Moore Dry Dock Co. 275 pages. \$3.50. Published by MacMillan Co., New York City. Covers up-to-date construction details, operation and maintenance procedures, basic theory, regulating exciters, trouble shooting charts, speed control.

**Instrument and Control Manual:** E. W. F. Feller, associate editor of *Power*, 426 pages. \$6.00. McGraw-Hill Book Co. Guide book for the man in the plant, with information on principles of control and construction of indicators. It describes and illustrates most modern instruments for measuring and controlling liquid levels, pressure, temperature, speed and humidity.

**Control of Electric Motors (2nd Edition):** P. B. Harwood, manager of engineering, Cutler-Hammer, Inc. 479 pages. \$5.50. Published by John Wiley & Sons, Inc., New York City. Wide variety of controls discussed, ranging from complicated mechanisms for newspaper presses to simple starters for small fans. Characteristics of controls are discussed, also design and construction. Problems included.

**Controllers for Electric Motors:** H. D. James, consulting engineer, and L. E. Markle, design engineer. 324 pages. \$4.50. Published by McGraw-Hill Book Co. Guide for selecting, operating and maintaining controllers and associated apparatus. Includes new uses for the electron tube, magnetic contactors, time-limit method of acceleration, development of plugging control, the amplidyne and rototrol.

**Magnetic Control of Industrial Motors:** G. W. Heumann, control engineer, General Electric Co. 589 pages. \$7.50 (in U. S.). Published by John Wiley & Sons, Inc., New York City. A comprehensive picture of the characteristics of control devices, the functions of commonly used control circuits and performance characteristics of various types of motors is presented with considerations governing the selection of controllers to perform specific jobs, external motor characteristics, basic magnetic devices and relays. Motor performance, circuit layouts and both ac and dc maintenance data are given.

**Generators and Motors:** D. J. Duffin. 210 pages. \$4.00. Published by McGraw-Hill Book Co. An on-the-job aid for motor repairmen, armature winders and maintenance engineers, describing and illustrating various makes, sizes and types of ac and dc equipment in commercial use.

**Repair Shop Diagrams (2nd edition):** D. H. Braymer, independent industrial engineer, and A. C. Roe, manufacturing engineer, Westinghouse Electric Corp. 387 pages. \$4.00. Published by McGraw-Hill Book Co. Diagrams and connecting tables for laying out coils and connecting them in proper sequence for motors from 2 to 24 poles, 2- and 3-phase.

**Troubles of Electrical Equipment (3rd edition):** H. E. Stafford, consulting engineer. 455 pages. \$4.50. Published by McGraw-Hill Book Co. A troubleshooting manual with hints, suggestions and prescribed methods for locating trouble in motors, transformers, relays, circuit-breakers, insulation, voltage regulators, lightning arresters, and other electrical equipment. Symptoms, causes and remedies are listed.

**Electric Motor Maintenance:** W. W. McCullough, Westinghouse Electric Corp. 126 pages. \$2.00. Published by John Wiley & Sons, New York City. Three sections dealing with mechanical maintenance, electrical maintenance, and application of motors provide rapid reference source.

**Rewinding Small Motors (3rd edition):** D. H. Braymer, formerly editorial director of *Industrial Engineer*, and A. C. Roe, manufacturing engineer, Westinghouse Electric Corp. 422 pages. \$4.50. Published by McGraw-Hill Book Co. All types of hand and machine-wound winding jobs are discussed from start to finish, illustrated by wiring diagrams, photographs, tables and charts.

**Electrical Appliance Servicing:** William H. Crouse. 854 pages. \$7.50. Published by McGraw-Hill Book Co. Gives principles, tested methods and techniques, servicing instructions and recommended tools for repairing all kinds of electric household appliances. Supplies step-by-step guidance for repairing such devices as resistance heating and motor-driven appliances, refrigeration units and air conditioners.

**Electric Motor Repair.** Robert Rosenberg, instructor in armature winding and motor repair, Brooklyn High School of Specialty Trades, New York City. Published by Murray Hill Books, Inc. 551 pages. Both ac and dc motors, including split-phase, capacitor, repulsion-type, polyphase, are explained in terms of construction, operation, trouble-shooting, repair and maintenance in this spiral-ring binder book. Over 900 illustrations show step-by-step repair procedures clearly, and construction of tough paper and ring-binder makes it practical to keep book on working surface for constant reference.

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Jefferson Transformer for wall, post, ceiling, pendant or messenger wire mounting.



Two-lamp Transformers serve two lamps, provide many savings in first cost, wiring and installation.



Weatherproof outdoor type for lamps used in lighting plant areas, boundaries, building fronts, etc., suitable for attaching to wall or post, or installed on pole top by means of an Adaptor.



**Maintenance Hints:** Compiled and published by Westinghouse Electric Corp. 373 pages. \$1.00 Useful 24-section pocket-sized reference book for inspection, ac and dc motors, insulation, bearings, lubrication, commutators, starters, transformers, circuit breakers, lighting, dipping and baking, brakes and generators.

**Electronics for Industry:** W. T. Bendz and C. Scarlott, Westinghouse Electric Corp. 501 pages. \$5.00. Published by John Wiley & Sons, Inc., New York City. Primarily discusses industrial applications. Topics included are electronic rectifier and oscillator, electronic timers, fluorescent lamps and electron microscope.

**Industrial Electronics:** A. W. Kramer, Editor of *Power Generation*. 311 pages. \$6.00. Published by Pitman Publishing Co., New York City. A practical, basic, beginners' book explaining in simple language what electron tubes are, how they work, how they evolved and how they are used.

**Industrial Electronic Control (2nd edition):** W. D. Cockrell, industrial engineer, General Electric Co. 385 pages. \$4.50. Published by McGraw-Hill Book Co. Types of tubes, fundamental circuit components, basic electronic circuits, accessory equipment, closed-circuit controllers, feedback amplifiers and servomechanisms are discussed in practical, non-technical text. Appendix includes nomenclature of electronics, ohmic values of resistance and reactance, standard curves, rectifier wave shapes, photoelectric phenomena and regulating systems.

**Industrial Electronics and Control:** R. G. Kloeffer, Head of E. E. Department, Kansas State College. 478 pages. \$5.50. Published by John Wiley & Sons. Covers basic theory related to electron tubes, associated circuits and control component devices. Direct, easily understood treatise on thyratrons, gaseous tubes, servomechanisms, crystal rectifiers, high frequency heating, X-ray application, resistance welding and special photo applications.

**Industrial Electronics Reference Book:** Electronics Dept., Westinghouse Electric Corp. 680 pages. \$7.50. Published by John Wiley & Sons, New York City. The "why" and "how" behind electronic principles, with liberal use of illustrations to clarify discussion on design and application, possibilities and limitations of devices, and fundamentals behind constantly-changing apparatus in the electronics field.

**Maintenance Manual of Electronic Control:** Edited by R. E. Miller (formerly on editorial staff of *Electrical Construction and Maintenance*), Weller Mfg. Co.; 8 contributors from General Electric Co. 304 pages. \$5.00. Published by McGraw-Hill Book Company, New York, N. Y. Covers circuits of electronic control, general considerations, installing and maintaining electronic control, the cathode-ray oscilloscope, electronics, timing and photoelectric relays, electronic controls for resistance welding, motor operation and temperature regulation, and sealed ignitron rectifiers. Simply written with minimum mathematics and liberal illustrations and charts with special emphasis on maintenance methods.

**Fundamentals of Light and Lighting:** Walter Sturrock and K. A. Staley, General Electric Co. 88 pages. \$1.00. Published by G. E. Ring-bound handbook uses

drawings, descriptive photographs, tables and color to discuss basic theories of lighting, fundamentals of photometry, candlepower distribution, brightness measuring equipment, reflection, diffusion, polarization, standards, tests and terminology. A practical working guide in lighting design.

**Fluorescent and Other Gaseous Discharge Lamps:** W. E. Forsythe and Elliot Q. Adams, General Electric Co. 152 pages. \$5.00. Published by Murray Hill Books, Inc., New York City. Included in this coverage are fluorescent, photoflash, sun, infrared, and germicidal lamps, infrared telescopes and signal devices and fluorescence in television. Discussion includes phosphors, activators, operating characteristics, function of ballasts, starting switches, various circuits, quality of lamps, color control and effect of power factor.

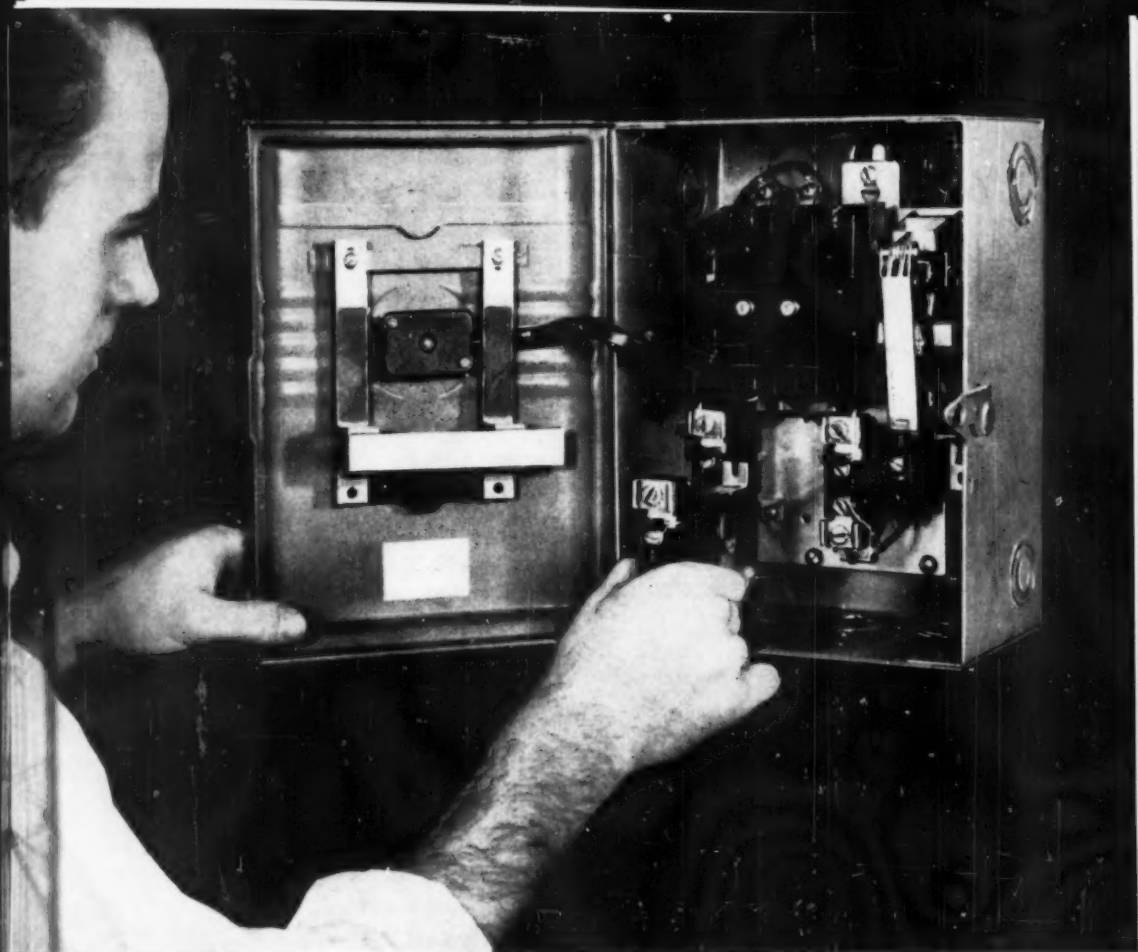
**Lighting Handbook:** Compiled and published by Westinghouse Electric Corp. Commercial Engineering Department, Bloomfield, N. J. Price \$2.00. 244 pages. Useful reference including discussions on the eye and vision, characteristics and measurement of light, lighting sources, lighting design and wiring, economical factors and practical engineering data for lighting stores, offices, public buildings, industrial, street, floodlighting projects, signs and airports.

**Fluorescent Lighting Manual (2nd edition):** Charles L. Amick, General Electric Co. 318 pages. \$4.50. Published by McGraw-Hill Book Co. Latest available information on new types and sizes of fluorescent lamps, auxiliary equipment improvements, new design data and recent lighting techniques included with calculations for lighting requirements and suggestions for maintenance and repair of lighting equipment. Also discussed are slimline and circline lamps, glare rating system, color and economics of lighting.

**IES Lighting Handbook:** Compiled and published by Illuminating Engineering Society, New York City. 850 pages. \$7.50. Complete reference guide on all phases of lighting, based upon rigid scientific and engineering standards. Carefully indexed and organized for maximum utility, the book is divided into two sections. The first part includes all design and application data; the second section containing manufacturer's material on equipment.

**Residential Lighting:** Myrtle Fahs Bender, Westinghouse Electric Corp. 280 pages. \$10.00. Published by D. Van Nostrand Co., Inc., New York City. Non-technical volume contains wealth of material on modernizing old homes, designing new ones, effect of fluorescent light on skins, food and fabrics, planning adequate wiring, styling for various rooms and planning special effects. Illustrations include 569 diagrams, sketches and photographs.

**Industrial Application of Infrared:** James D. Hall, Westinghouse Lamp Division. 201 pages. \$4.00. Published by McGraw-Hill Book Co. All essential data on the significance of infrared in the field of heat transfer operating characteristics, outlines for test procedures, data on installation design, domestic and miscellaneous applications for infrared, effect of infrared on the human body, infrared glass filters and gas-fired infrared generators. Practical handbook for design and application.



**TO THIS BASIC STARTER UNIT** can be added a choice of selector switch or push-button stations, auxiliary contacts, transformers and extra overload relays.

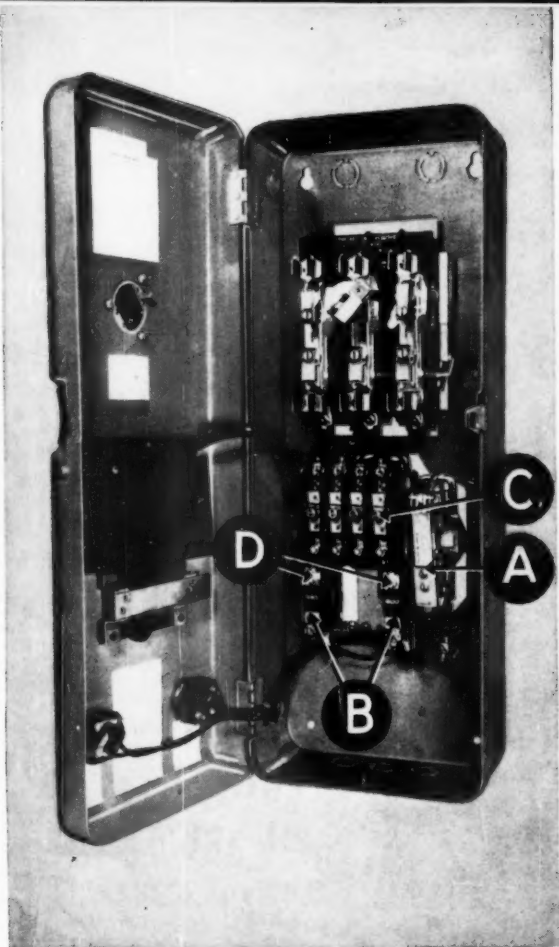
## NEW LINE OF MOTOR CONTROL WITH PACKAGED ACCESSORIES

This magnetic starter unit is complete in itself, yet it's built to take on—in the field—additional control accessories.

This latest Trumbull development—identified as HM motor controls—permits adding on to the basic starter unit such accessories as extra overload relays, auxiliary switches, selector switches, push-button stations, transformers, coils, etc.

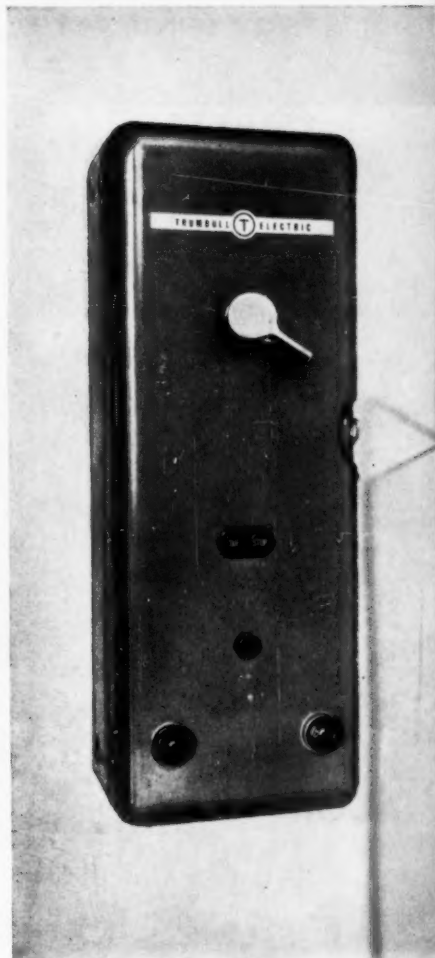
Inventories, obviously, can be reduced. Fewer units can be made suitable for more jobs merely by installing the proper accessories in the field.

For full information on Trumbull's HM line of controls—sizes 0 through 3 for 110-600 volt service, fractional through 50 hp—address TRUMBULL ELECTRIC, Department of General Electric Company, Plainville, Connecticut, and ask for TEB-3.



**THE SAME MAGNETIC STARTER** also comes combined in one enclosure with Trumbull's HCI (High Capacity Interrupter) or a circuit breaker disconnect. Note Trumbull's (A) time-proved clapper-type controller. Its self-aligning, shock-absorbing armature assembly protects coil, prevents chatter, prolongs contactor life . . . (B) new sensitive control circuit—trips only

for dangerous overload or undervoltage conditions . . . (C) high-hardness, double-break contacts that are self-wiping and installed in dust-free vertical position, which also permits easy servicing and straight-through wiring . . . (D) overload relay shift lever that moves easily from one slot to another for quick change from manual to automatic reset.



**THIS TRIM-LINED ENCLOSURE** combines a magnetic starter with circuit breaker disconnect and provides mounting space for all the various accessories. Note provision for padlocking. Easy to wire because complete interior can be removed simply by loosening the screws.

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DEPARTMENT OF GENERAL ELECTRIC COMPANY  
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PETERSON LITHOGRAPHING COMPANY  
Omaha, Nebraska



## Read What One Contractor Says About Wakefield Installing Ease

**"best engineered hanging features, thoughtful design,  
easier to hang, saving labor and time . . ."**

James H. Dodson, President, Dodson Electric Company of Omaha, writes about a recent installation of 120 Wakefield Grenadiers:

"I would like to state that the Wakefield Grenadier has, to my knowledge, the best engineered hanging features of any fixture on the market, and as a consequence of the thoughtful design, the labor saved in hanging the Wakefield Grenadiers is a major factor to be considered when bidding a job. Not only are they easier to hang but their superior design gives the electrician little if any trouble, thus keeping him in a better frame of mind and enabling him to work faster. And our elec-

tricians have told me many a time that it is a pleasure to hang a Wakefield Grenadier.

"As you know, the cost of the slimline fixture is slightly higher than that of the bi-pin fluorescent. However, we found that due to freedom from internal splices within the fixture, we saved labor in hanging the slimlines; thus equalizing the price of the two. The fixtures were installed on 5' centers and the average footcandle reading after completion was 110.

"The entire order was received in excellent condition. Out of the 120 fixtures, we did not have one failure or one hesitation."



JAMES H. DODSON

**Designed for Contractors  
by.....**

# Wakefield Over-ALL Lighting



GRENADIER



STAR



COMMODORE



WAKEFIELD CEILING

# In The News

## Southeast NISA Chapter Holds 13th Convention

The Southeastern Chapter of the National Industrial Service Association held its 13th annual convention November 2nd and 3rd at the Sir Walter Hotel in Raleigh, N. C., with 200 delegates in attendance.

Called to order by Chapter President W. Hall Grey, Southern Electric Service Co., Greenville, S. C., the first session included five addresses and an open forum on small motors.

First to speak was National President M. F. Zack, Zack Bros. Elec. Co., Mason City, Iowa, who defined the objectives of a strong trade association, then measured NISA by standards of fostering commercial interest of members, correcting trade abuses relative to the industry, securing relief from unjust legislation, collecting and disseminating information of value to members and the public, promoting uniformity of trade practices, arbitrating differences between members and encouraging the exchange of practical ideas.

In an analysis of the shortage of copper allocated to motor shops, George Brown, president of Insulation & Wires, Inc., St. Louis, Mo., stated, "It should be remembered that the United States, in addition to meeting our own military and civilian needs, is pledged to help supply other member nations of the U. N. with critical materials. In the case of copper, over 70% of our wire mills' total output is already allocated to military, export and civilian uses not related to motors.

C. C. French, former national NISA president, French-Gerleman Elec. Co. of St. Louis, Mo., discussed the future of the repair shop under the defense program.

Frank W. Willey, NISA Director Emeritus, founder and past president, also president of the Willey-Wray Elec. Co., Cincinnati, Ohio, explained the principle of profit sharing in the motor shop industry. Using examples from his own company's 32 years experience with this type of organization, he indicated that profit sharing increases gross profits and is mutually beneficial to management and labor.

Proper lubrication of bearings was the subject discussed by J. Forest Collins, Jr., lubricating engineer for the Texas Co., Houston.

The forum on small single-phase motors, conducted by Charles A.



**NISA NATIONAL EXECUTIVES** attending the Southeastern Chapter convention included Fred B. Wiperman, Executive Secretary, St. Louis, Mo.; past presidents H. E. Grant, Nashville, Tenn. and R. E. Ward, Raleigh, N. C.; past president and Director Emeritus F. W. Willey, Cincinnati, Ohio; incumbent president M. F. Zack, Mason City, Iowa; Directors T. M. Russell, Mobile, Alabama, and Howard A. Lilly, Tampa, Florida, and past president Charles C. French, St. Louis, Missouri.



**ELECTRICAL MAINTENANCE WORKSHOP** held in Rochester, New York, under the auspices of the Electrical Association of Rochester attracted hundreds of industrial electrical maintenance department heads and electrical contractors to a two-day panel conference and trade show.

Morris, Southern Elec. Service, Charlotte, N. C., and Ed Grant, Tennessee Elec. Motor Service, Nashville, was truly "a bull session within subject limitations and everybody in the act."

The second day's business session, chairmanned by O. A. Clot, Peninsula Armature Works, Miami, Fla., included a discussion of the Control Materials Plan by NPA's Michaels; a talk by J. Arthur Turner, Sr., former NISA president and owner of Tampa Armature Wks., Tampa Fla., and two forums; the first on shop gadgets, led by R. E. Ward, Jr., Elec. Motor and Repair Co., Raleigh, and

the second on large motors, mutually conducted by Howard Lott, co-owner of the Orlando Armature Wks., Orlando, Fla., and Ed Jenkins, Armature Winding Co., Charlotte. Also included was the election of officers.

Elected as chapter officers for the 1951-'52 term were O. A. Clot, Peninsula Armature Wks., Miami, Fla., president; L. W. Cleveland, Cleveland Elec. Co., Atlanta, Ga., vice president, and W. S. Ward, Elec. Motor & Repair Co., Raleigh, N. C., sec.-treas.

An inspection trip through Liggett & Myers new tobacco plant at Durham and evening visitations to the shops



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## 5-in-1 Outfit



5-in-1 Precision Outfit . . . \$22.50

### Precision Flame Control for SOLDERING, HEATING, BRAZING

An all 'round outfit—as easy to use on a pole or underground as in the shop... Four stems and soldering copper handle all soldering, heating, and brazing work... Needle valve control gives exact flame and heat for each job... Lights instantly at full heat regardless of drafts or weather

... No pumping, priming, or generating  
... No smoke or fumes.

Ask your nearest "Prest-O-Lite" Jobber or write us for further details. Linde Air Products Company, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd Street, New York 17, N. Y.

The term "Prest-O-Lite" is a registered trade-mark of Union Carbide and Carbon Corporation.

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POWER VISE STAND

Standard range 1/2" to 2" pipe. Range with Drive Shaft 2 1/2" to 6" pipe.

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**Exclusive "Auto-Grip" Chuck!**  
This automatic-gripping front chuck is standard equipment on every OSTER POWER VISE STAND. No bars or wrenches needed! Grips any kind of pipe automatically!

Write for complete catalog information NOW!

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## Electrical Conduit IAC Meets

Three major recommendations, all seeking to prevent disruption in the normal distribution of electrical conduit for defense and civilian use, were made by the Electrical Conduit Industry Advisory Committee at its meeting recently with officials of the National Production Authority, held in Washington, D. C.

The recommendations were:

1. That NPA Order M-17 be amended so that manufacturers of electrical conduit will be required to accept *only* those orders rated A, B, C and E by the Defense Department and the Atomic Energy Commission up to 25% of a firm's monthly output. At present, M-17 requires manufacturers to accept *all* rated orders (military, AEC, and all others) up to 25% of their monthly production. Members made this recommendation because they believe manufacturers could more equitably distribute electrical conduit.

2. That *all* rated orders, other than those identified by the symbols A, B, C or E, presently on manufacturers order books, be invalidated. By such invalidation, members said, manufacturers would not have to make priority delivery of any orders except those bearing the symbols A, B, C or E (military and AEC orders).

3. That a manufacturer's acceptance of A, B, C or E orders above 25% of his production shall not serve as a basis for revision of CMP allotments. Otherwise, members said, manufacturers would seek orders bearing these symbols exclusively and thereby neglect those which are unrated.

The committee also urged that Government bureaus, including the military, be requested to specify black enamel conduit as covered under present Government specifications, wherever suitable, instead of zinc-coated conduit, to conserve zinc.

Members said they are hampered by poor scheduling on the part of some Government purchasing agents that call for quick delivery of large quantities of conduit—a longer lead-time would be more desirable and would not disrupt production schedules.

The committee stressed the essentiality of conduit, which can withstand mechanical abuse, vibration, oil, grease, weather, explosions and other hazards.

NPA said the Government's major concern is to make sufficient materials available to fill direct orders from the Defense Department and Atomic Energy Commission (those orders with A, B, C and E ratings). Shipments on all other rated orders will then be given equal consideration in the allotments, NPA declared.

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**PERMITS  
UP TO 50%  
FUTURE  
LOAD  
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IT'S THE A.V.C.  
"SANDWICH" THAT MAKES  
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Now, when the building is in the construction stage, is the time to plan for future load growth. By using Rockbestos A.V.C. on a size for size basis with R or RH, you automatically provide up to 50% for future load growth. And, best of all, you get this advantage without using more steel, more man hours or more copper.

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This "sandwich" protects the varnished cambric. It enables A.V.C. to carry more current than cables with conventional insulations



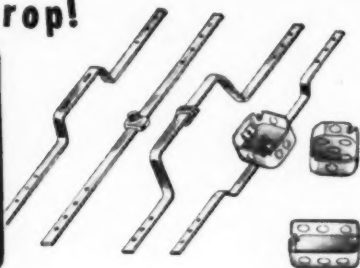
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**Cream of the Crop!**

## KEYSTONE Outlet Boxes and Bar Hangers!



Little things can make a big difference on any wiring job you do. And it's the little things about Keystone bar hangers, outlet boxes, and box covers that make them the "cream of the crop" for you. For example . . .

**KEYSTONE BAR HANGERS**—Made of  $\frac{3}{4}$ " x  $\frac{1}{2}$ " band steel with rounded mill edges and sliding, easy-working, durable double strength studs. Available in straight, shallow, deep, or universal offset cleat types . . . and in standard lengths of 19 $\frac{1}{2}$ ", 21" and 24". Special lengths furnished upon request.

**KEYSTONE OUTLET BOXES**—Heavy gauge steel construction with  $\frac{1}{2}$ " or combination  $\frac{1}{4}$ " and  $\frac{3}{4}$ " knockouts. Strong BX or Romex clamps assembled to box with nested fit for quick and easy pulling of wires and lower installation costs. Available in 4" Octagon or Handy box types . . . separate or in combination box and bar hanger assemblies.

**FREE!** Keystone's new "value-packed" Catalog containing complete information on standard Keystone wiring installation equipment. Write for your copy today!

• It pays to "figure on Keystone!"

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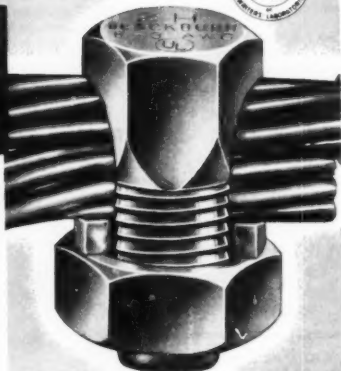
Sold Through Leading Electrical Wholesalers Coast-to-Coast

**NOW!** Territories open for agents with warehouse facilities. Write for full particulars!

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## BLACKBURN *Hi-Strength* CONNECTORS

Avoid "loose joint" trouble and the cost of running it down; use **BLACKBURN Hi-Strength Connectors!** Tests show that they definitely produce higher pressure connections—*trouble-free* connections. It costs less to use the best—use **BLACKBURN**. UL Approved from No. 10 to 1,000,000 CM.



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## Copper Conservation

Electrical equipment manufacturers are now taking conservation measures which will reduce the copper content of their products five to ten percent, they recently told Defense Production Administration and National Production Authority officials.

The problem of copper conservation was discussed at a conference of representatives of five key electrical equipment manufacturers, and officials of the NPA and the DPA conservation division. Two observers from NEMA also attended.

Industry representatives reported that copper conservation, particularly through substitution of aluminum, has been under continuous consideration by most companies for some time. They emphasized:

1. No other metal, except perhaps silver, will conduct electricity as efficiently as copper.

2. A maximum copper substitution of about 25% is possible on a long-term basis.

3. Limited substitution of aluminum for copper in conducting usage is possible, particularly in bus bars, motor windings, control wiring, etc.

4. Aluminum has a number of disadvantages as a substitute for copper. Among these are: lower conducting efficiency; increased brittleness; lower melting point; lower resistance to corrosion; greater difficulty in making connections.



**COOPERATION** between local unions and contractors was recently demonstrated in Colorado Springs, Colo. When a gas explosion destroyed the Ardith E. Thanschmidt home in Colorado Springs, critically injuring the Thanschmidts and killing one of their three children, local unions and contractors built the family a new home. Dave Tinning, business manager of I.B.E.W., Local 113, was chairman of the relief project and of the construction committee. Colorado Springs Section, Rocky Mountain Chapter, NECA, donated electrical materials, and Local 113 did the installations. Mr. Tinning is shown watching Edgar Nelson.



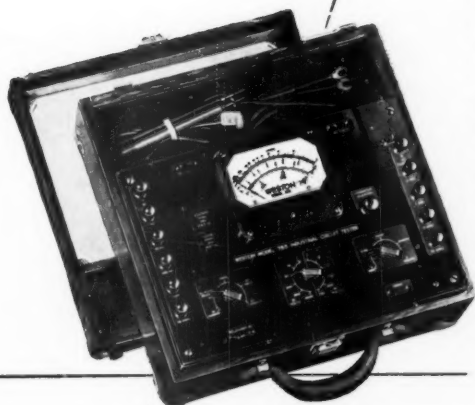
# #785 Checks them all!

**ELECTRONIC EQUIPMENT**— used increasingly throughout industry for sensitive indicating and control applications.

**CONTROL CIRCUITS**— whether built into your products, used in your processing, or rigged up in the lab.

**MOTORS, GENERATORS**— as well as relays, transformers, and similar electrical mechanisms.

**ELECTRICAL DEVICES**— of all sorts...either at the test bench or right in the shop.



• Yes, you can check just about any circuit from sensitive electronic equipment to electrical motors with this Weston Model 785 Industrial Circuit Tester. Here, in one case, is all the equipment you need for most circuit testing:

**D-C VOLTS:** 0.1/1/10/50/200/500/1000 volts.

**A-C VOLTS:** 5/15/30/150/300/750 volts.

**D-C CURRENT:** 50 microamps; 1/10/100 milliamps; 1/10 amps.

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**RESISTANCE:** 0.3,000/30,000/300, 000 ohms; 3/30 megohms.

Other features not available in testers of this type include: unlimited current measurements with the use of external transformers or shunts—voltage and current circuits completely isolated to provide greater flexibility and meter protection—potential and current connections can be made simultaneously. Phone your local WESTON Representative, or write—WESTON Electrical Instrument Corporation, 589 Frelinghuysen Avenue, Newark 5, New Jersey.

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DUAL SILVER POINT — FULLY AUTOMATIC

## FLUORESCENT STARTERS

**—completely eliminate  
annoying blinking  
and flickering of dead  
fluorescent lamps!**

**GUARANTEED — FOR ONE YEAR!**

This is a glow switch condenserless precision starter equipped with automatic thermal relay circuit breaker. The relay automatically removes the lamp from the circuit electrically when the lamp becomes de-activated and automatically resets upon interruption of the lamp circuit.

**SIMPLIFIES** — Replacement of defective lamp automatically recycles starter circuit. No buttons to push — no replacement of starter.

**REDUCES COST** — Magno-Tronic starters provided exact timing of electrode heating, preventing excessive loss of emission material, thus assuring maximum possible lamp life.

**VERSATILE** — Built to operate efficiently over an extended voltage and temperature range.

Demonstration and Literature on Request.



SP-15-20 For use with 15 or 20 watt lamps.

SP-30-40 For use with 30 or 40 watt lamps.

SP-85-100 For use with 100 watt lamps.

Manufactured under  
U. S. PATENTS

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Other Patents Pending



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Radiant Hi-Flood Lamps are designed especially for industrial use outdoors or indoors for high or low bay lighting. No expensive enclosed fixtures needed. Special weatherproof glass won't crack due to sudden temperature changes, moisture, vibration, and impact of flying insects. Lamps stay bright because dust, vapors, and fumes can't affect the sealed-in silver reflecting surface.

Let us show you how Radiant Hi-Flood Lamps can cut your installation, maintenance, and power costs. Sizes from 200 to 1,000 W, high or standard voltages.

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The symbol  
of quality  
in lamps

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Manufacturers of Lamps for PROJECTION • FLOODLIGHT • SPOTLIGHT • MOTION PICTURE PRODUCTION  
SOUND REPRODUCTION • AERONAUTICAL • SPORTS LIGHTING AND GENERAL SERVICE • RECTIFIER BULBS



## Fleischmann To Address Plant Maintenance Conference

Manly Fleischmann, administrator of the Defense Production Administration, will head a group of 56 speakers in the most extensive discussion of plant maintenance problems ever undertaken, to be held at the Plant Maintenance Conference, Convention Hall, Philadelphia, January 14-17. The conference, to be held in conjunction with the Plant Maintenance Show, will have as its general chairman L. C. Morrow, consulting editor for *Factory Management and Maintenance*. More than 14,000 are expected to attend the technical sessions and visit the exhibits.

Special emphasis in both the conference and exhibits will be placed on preventive maintenance, with over 30 separate sessions devoted to plant problems, electrical equipment, power plants, materials handling, maintenance costs, inspection methods, training and scheduling procedures, safety and plant protection, welding, personnel and operating policies.

## NISA News

The NISA Board of Directors met in Chicago on October 13-14. Bob Kaska and Paul Sievert, co-chairmen, reported on the Chicago Convention Committee. The technical program will lean more to the forum and discussion type. The President's Reception will start things off. One of the innovations this year will be Exhibitors' Night with music and entertainment in the spacious Exhibit Hall of the Stevens Hotel. All of the shop visits will be scheduled for Thursday, April 24, in line with the desires of the membership expressed last summer.

The Membership Committee reported that there were 1198 active members and 52 associate members.

On September 23 Joe Previty was the narrator in a TV program on Station WPTZ, Philadelphia, entitled "You and Your Job." It displayed the work opportunities in a motor repair shop, specifically the Penn Electric Motor Co.

The Greater St. Louis Chapter entertained their wives at a barbecue at Shady Acres, in the foothills of the Ozarks, October 18. Games, folk songs, and square dancing were participated in by the group. Dick Giles brought his violin from the Cape, and Tom Zimmerman from Jeff City was the caller. Art Heil and "Chuck" Schaeffer did a good job in contributing to the fun.





Longer resistor life as afforded by P-G is the result of exclusive features of design coupled with use of the most durable raw materials.

Grid plates are shaped for maximum ventilation and heat dissipation with tests showing unusually even temperatures over the entire working surface. Thus, "hot spots" one source of resistor trouble, are eliminated.

Unique methods used to mount grid plates in their supporting assemblies is equally important to long resistor life. P-G "floating bolt" construction allows the resistor to expand as operating temperature builds up. Thus damage from expansion, another source of resistor trouble, is minimized.

These and similar practical features of design, plus Steel and Mica as basic materials make P-G the answer for longer resistor life. Ask for Bulletin No. 500E for more detailed information.



*The Nonbreakable Steel Grid Resistor*

**THE POST-GLOVER ELECTRIC COMPANY**

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## NEW *Wheelock* CODE CALL FOR INSTANT COMMUNICATION



Code call is made by a numerical code, sounding signals.

Promptly completes telephone connections with organization personnel away from their own telephones.

Eliminates time waste of telephone operator and other employees in "man-finding."

Enables employees without telephones to answer nearest telephone.

Write for New Bulletin 84-3

### SIGNAL ENGINEERING and MANUFACTURING COMPANY

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The Midwestern Chapter meeting on September 29 was held at the Mayfair Hotel, Sioux City, Iowa. The next quarterly meeting will be held in Omaha. Mr. McIntosh of the Spencer Thermostat Corp. spoke on Klixon products and George Holden discussed the copper situation.

• • •

The Great Lakes Chapter had 50 members and guests present at the Standard Electric Motor Works for its October 8 meeting. Mr. Hall of Reliance Electric & Engineering Co. gave an insight on the methods of servicing variable speed drives.

Meeting night of Great Lakes has been shifted to the 3rd Monday of the month. The November 19 meeting is to be held at the Barker-Fowler Electric Co. in Lansing.

• • •

The Quaker City Chapter meeting was held October 10, at Beck's on the Boulevard, Philadelphia. Roll call showed 40 present with J. B. Wanger, president, presiding. The speaker of the evening was Rear Admiral Logan Ramsey, U.S.N. retired; executive vice president of Spring Garden Institute, who talked on the coming shortage of manpower.

• • •

New York Metropolitan Chapter elected the following committees for the current year: Program—Herb Englemen—Chairman, Milt Burner, Milt Volker, Ken Fisher, Henry Drexler, Irvin Brown; Advertising & Publicity—Walter Leirer—Chairman, Louis Lidsky, John Urban, James Domizio, Joe Brown, Sam Heller; Defense Activities Committee—Wm. Wheeler—Chairman, Geo. Lockwood, Al Bonahur; Membership—Alex. A. Shovan—Chairman, Geo. Lockwood, Bill Wheeler, Al Bonahur, Hilbric Q. Griffith; Attendance—Meyer Freidkin—Chairman, Robt. McKeown, David M. Kelly, John Ryan, Carl Christiansen, Walter A. Coogan, Frank Wurth.

From Walter J. Priese, The Maintenance Co., New York City.

## A. I. Appleton

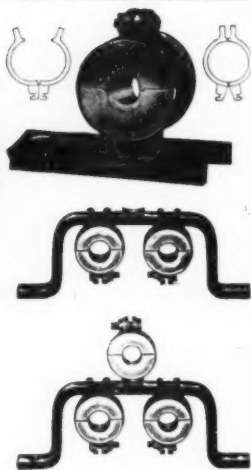
Albert Ivar Appleton, founder of the Appleton Electric Company, Chicago, died October 18th.

Born in Halland, Onsala, Sweden, March 20, 1872, Mr. Appleton came to Chicago in 1885. In 1903, he formed his own company, the Appleton Electric Company, and started to manufacture electrical conduit fittings and specialties. In 1946 when Mr. Appleton retired from active business, his son, Arthur I. Appleton, assumed full management as its president and treasurer.

For QUICK, EASY, SAFE  
Cable Installation  
"EFFICIENCY"  
NESTED  
CONDUCTOR RACKS

Efficiency Nested Conductor Racks are simple, compact and are scientifically designed to carry conductors equidistant from center to center. One bolt supports the bushing and clamps the bushing support to the frame. Available in 2-3-4-5 and 6 bushing racks.

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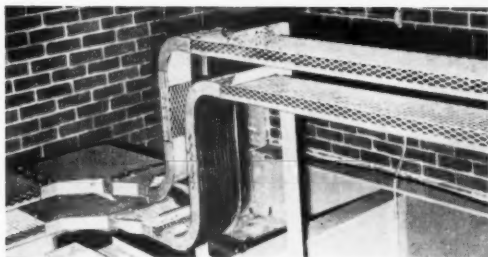
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**"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION**

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Save MATERIAL  
Save MAN-HOURS  
Save COSTS

## with the new system of COPE CABLE TROUGHS



Today's State of Emergency requires everyone to make savings wherever he can. By using Cope Cable Trough, you save in all possible ways . . . material, man hours and costs.

In addition, there is no better system on the market for the support of Cable and Instrument Tubing.

**MODERN, STREAMLINED DESIGN**—Conserves material and at the same time makes the troughs simple and versatile.

**MAN HOURS CUT**—Engineering costs are slashed when Design Engineers can order a complete installation from the Cope Cable Trough catalog. Installation costs are cut to the bone with simplified assembly.

**SAVINGS UP TO 66%**—Users say Cope Trough saves them real money (one large utility stating as high as 66%) over other methods.

**ENGINEERING HELP**—Where unusual problems in your installation perplex you, instead of devoting your time to the solution, request our Engineering Staff to solve them for you. Every day Cope solves such problems for its customers.

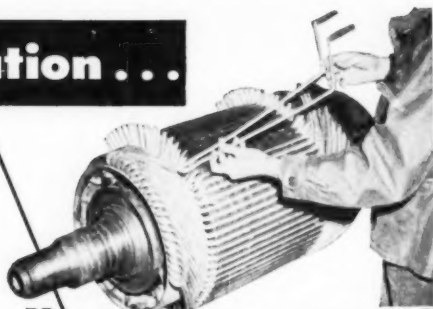
If you have not already done so, write today for the new bulletin on Cope Cable Trough.

T.J. *Cope* INC.

T. J. COPE, INC., 711 SOUTH 50th ST.  
PHILADELPHIA 43, PENNSYLVANIA



**in insulation ...**



**"a penny saved  
is not a penny earned"**



No indeed. In fact, that penny saved may mean a lot of dollars lost later on—lost through expensive, time-consuming repairs on rotating electrical equipment. Repairs which shut down an electric motor badly needed on the production line. And it can all be the result of one tiny weak spot in the insulation. How to prevent it? Specify uniformly top-quality National insulation. It's always premium quality and it's competitively priced.

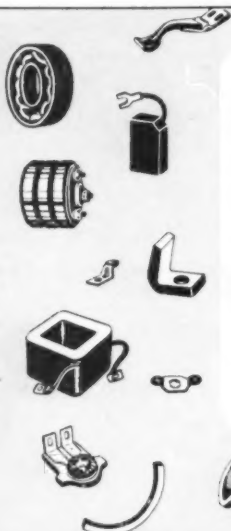
## NATIONAL ELECTRIC COIL COMPANY

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ELECTRICAL ENGINEERS, MAKERS OF  
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## Among the Manufacturers

### Headquarters Announcements

Rome Cable Corp., Rome, N. Y.—Frederick S. Marks, sales manager.

General Electric Company, Schenectady, N. Y.—Arthur W. Bartling, manager of product sales practices for the Apparatus Sales Division; Frank T. Lewis, manager of Manufacturing Personnel Development Services.

National Carbon Company, New York, N. Y.—Adger S. Johnson, president.

Sylvania Electric Products Inc., New York, N. Y.—Frederic J. Robinson, director of the International Sales Division.

Allis-Chalmers Company, Milwaukee, Wis.—F. C. Ludington, manager of Hawley Works, West Allis.

Unistrut Products Company, Chicago, Ill.—W. J. Rashleigh, sales executive.

Westinghouse Electric Corp., Pittsburgh, Pa.—L. E. Osborne, executive vice president for defense products; Tom Turner, vice president in charge of manufacturing and labor relations; Warren Ullom, purchasing agent for the Appliance Division, Mansfield, Ohio.

Feedrail Corp., New York, N. Y.—R. E. Nugent, chief engineer; G. H. Baumann, sales manager.

Miller Electric Mfg. Co., Appleton, Wis.—C. Burnell Abel, vice president in charge of sales; R. A. Metcalf, sales manager.

Rodale Mfg. Co., Emmaus, Pa.—Elmer A. Barto, vice president.

Jones Metal Products Co., West Lafayette, Ohio.—Herbert Boyer, vice president in charge of sales; R. P. Harner, director of sales for the Abolite Lighting Division.

D. W. Onan & Sons Inc., Minneapolis, Minn.—George R. Barda, sales promotion manager.

Copperweld Steel Co., Glassport, Pa.—T. Y. Henry, division manager of new subsidiary, Flexo Wire Company, Oswego, N. Y.

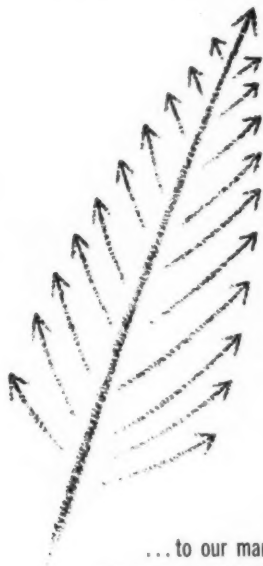
National Electric Products Corp., Pittsburgh, Pa.—announces the purchase of million-dollar factory in Elizabeth, N. J.

Rhode Island Insulated Wire Co., Providence, R. I.—announces transfer of its national selling offices from Providence to Chicago, Ill.

General Electric Company, Bridgeport, Conn.—announces establishment of official headquarters for the major appliance division at Louisville, Ky;



**... everything points to another year of Leviton progress**

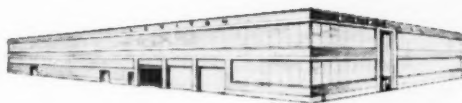


... to our many loyal old friends  
and new acquaintances who have found  
us deserving of their patronage...

we extend the

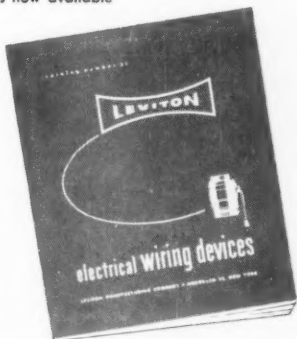
*Seasons Greetings*

**LEVITON MANUFACTURING COMPANY**  
main office: Brooklyn 22, New York  
**American Insulated Wire Corporation**  
A Leviton Subsidiary: Pawtucket, Rhode Island



the New Chicago Warehouse will be in operation.

the New Leviton no. 51 Catalog  
is now available





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### Regional Appointments

#### NEW ENGLAND

Graybar Electric Company: W. V. Quigley, operating manager at Providence, R. I.

#### MIDDLE ATLANTIC

General Electric Company: H. C. Green, northeastern district representative for the Construction Materials Division in the Buffalo area.

Wilson-Albrecht Company: Santo Bianchini and Sons, Philadelphia, Pa., exclusive representative for Waco scaffolding equipment in the Philadelphia area.

General Controls Company: Felix Wengerter, district manager of New York and Newark branch offices.

Graybar Electric Company: Charles G. Campbell, operating manager at Reading, Pa.

#### SOUTH ATLANTIC

The Edwin F. Guth Co.: Dooty & Downie, Baltimore, Md., representatives for Maryland, Virginia and Washington, D. C.

General Electric Company: Richard Creighton, in charge of the Charlotte, N. C., branch warehouse of the Lamp Division.

Wagner Electric Corporation: W. H. Prewitt, Jr., manager of the electrical division branch office in Atlanta, Ga.

Graybar Electric Company: J. C. Tresnauk, operating manager at Richmond, Va.

Unistrut Products Company: Brad Fogarty, southeastern district manager at Atlanta, Ga.

#### EAST CENTRAL

Reliance Electric & Engineering Company: Karl H. Meyer, manager of the Ivanhoe division at Cleveland, Ohio.

Graybar Electric Company: H. C. McKenney, operating manager at Dayton, Ohio; C. J. Fiely, operating manager at Evansville, Ind.; Howard Sommer, operating manager at Memphis, Tenn.; W. T. Bronson, manager of the Lansing, Mich., branch.

#### WEST CENTRAL

Graybar Electric Company: M. E. Lee, operating manager at Aberdeen, South Dakota.

#### WEST

Unistrut Products Company: Duncan A. Brownlee, sales and service representative for the West Coast.

General Electric Company: R. E. Wendling, Pacific district representative for the Construction Materials Division at Los Angeles, Calif.

# Coupling Conduit?

it's easy...

with an O.Z. Split Coupling



UL Approved

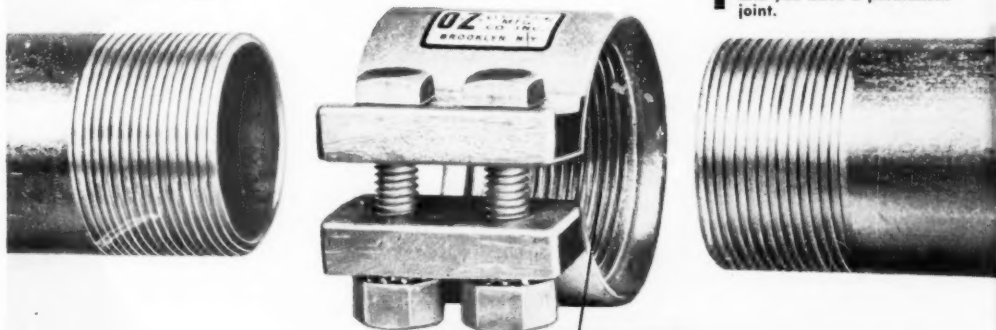


## THESE YOUR PROBLEMS?

Not enough space  
No room for wrench  
Hard to get at  
Conduits can't be turned

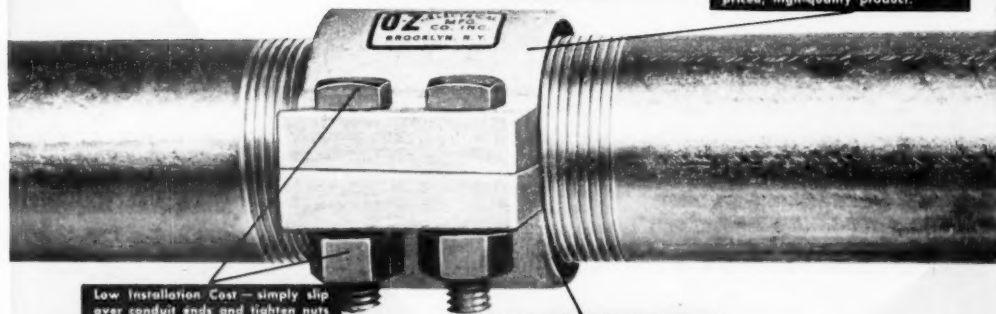
## HERE'S YOUR ANSWER!

O. Z. is the simple, dependable way to couple conduit. Just butt the conduit ends within the opened O. Z. Split Coupling, tighten two nuts and you have a permanent joint.



Interior Threading — meshes with conduit threading for a rigid close-fitting connection.

Low Price — simple, one-piece malleable iron construction assures low-priced, high-quality product.



Low Installation Cost — simply slip over conduit ends and tighten nuts to close fitting. Bolt head is held in place by coupling shoulder.

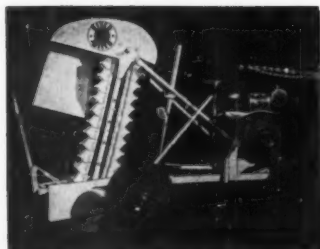
Available for conduit sizes ranging from 1/2" to 5".

**O.Z.** ELECTRICAL  
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Your local O. Z. distributor is ready now to serve you from stock. Get in touch with him for further information on the complete, dependable O. Z. line of electrical fittings.

CONDUIT FITTINGS • CABLE TERMINATORS • GROUNDING DEVICES  
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**'DOES THE WORK OF 8 MEN'**  
— says enthusiastic user

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• Cuts a 5½" trench. Newest design — rugged, and extremely mobile. Powered by a heavy duty, air-cooled Wisconsin Engine. DITCH-WITCH pays for itself in a few weeks because first cost is low and operation is economical. DITCH-WITCH proved in various soils in all parts of United States.

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A power tool of many uses for electrical contractors and plant maintenance work. Hammer is detachable from drill member. Drills concrete ½" to 1½" diameter, mortal to ¾" and wood to ¾". Forged hammer tools for chipping, channelling and cutting masonry materials. Attachment for right angle drilling.

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See Full Line—Page E-5—51-52  
McGraw-Hill Elec. Cat.  
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1316B Prospect—Dearborn, Mich.



**TO SETTLE A** disputed point C. F. Lyons (left) Lyons Electric Co., Dayton, Ohio; and Patrick Sankuer, chief electrical inspector, Warren Township, Van Dyke, Mich., consult the NEC at Omaha inspector meeting.

## WILL COPPER LIMITS STRANGLE A/W?

[FROM PAGE 50]

planned wiring in itself was responsible for the total copper saving, we do know that it helped some.

Our survey pointed up the following factors which will exert a profound influence on "living within the limits of the law" with respect to copper restrictions:

1. Service location.
2. Location of major appliances with respect to service equipment.
3. Possible use of "load center" plan with feeders going to central distribution from service instead of numerous long branch circuits.
4. Systematic planned wiring to conserve copper.
5. Restrictive local regulations—structural as well as electrical.

I hope that this information will help you develop your own exact statistics. Your territory and local conditions may "up-end" all the conclusions we reached. But, this much is certain: the trend is toward smaller type housing; individual conditions (service location, local regulations, number of heavy duty circuits) will cause definite barriers; planned wiring may well be a determining factor in many installations. Above all, the basic requirements for Adequate Wiring in popular sized or project homes can be fulfilled within the 35-pound copper limitation.

## MODERN METHODS MEAN SAVINGS

[FROM PAGE 55]

future heavy-duty service, power panels, sewage disposal pumps, boiler-house and ash-handling equipment, ventilation fans, compressors and a scrap crane. All busducts are equipped with 45-kva capacitors, plugged through 100-amp fused safety switches.

### Centralized Motor Control

Where concentrations of motorized machines warrant, motor controls are centralized in unified control centers. With starters, relays and circuit protection for several motors located together and with only push-button stations required at the individual machines, more working space at the machines is available, safety to personnel is enhanced, the layout of the electrical system is simplified and maintenance is concentrated to a few rather than to many locations.

Electric heating is utilized in numerous applications; with infrared lamps softening excess wax to be wiped from tops of beverage cans, with electric furnaces assuring consistent results in the heat treating of tools and dies, and with radiant heating ovens and tunnels used to speed various baking and drying processes. Largest of these units is a 160-foot infrared tunnel having 10 lamps installed per running foot. Lamps, varying in size from 125-watts at the "cool" end to 1000-watts at the completion terminal, constitute a connected load close to 400-kw. Heating control is by sections, and tunnel sides are movable so as to adjust cross-sectional area to the bulk of the products being processed.

As Continental's 65th production center, this modern plant contributes to the company's \$400-million annual gross sales volume; a volume including not only cans, drums and containers, but such defense-designed products as fuses, mines, shells and grenades, rockets, ammunition boxes, cartridge belts and airplane parts.

This modern 700,000 sq. ft. assembly building with 2-story office section consolidates four former plants into one. It incorporates many progressive electrical and structural ideas and stresses the advantage of horsepower over manpower through numerous task-lightening applications of power. The plant was designed and constructed by the Wigton-Abbott Corporation, Plainfield, N. J., with wiring installed by A. Neri, electrical contractor of Hoboken, N. J.



**First National Building, Tulsa, Oklahoma**  
**Architects:** Carson and Lundin  
**General Contractors:** Manhattan Construction Co.  
**Electrical Contractors:** J. Livingston and Co.



**The Mutual Life Bldg., New York, N. Y.**  
**Architects:**  
 Shreve, Lamb and Harmon Associates  
**General Contractors:** Turner Construction Co.  
**Electrical Contractors:** Lord Electric Co., Inc.



**Statler Center, Los Angeles, California**  
**Architects:** Holabird and Root and Burgee  
 Associate: William B. Tabler  
**General Contractor:** Robert E. McKee General Contractor, Inc.  
**Electrical Contractor:** Stetson Electric Company



**Sunshine Biscuits, Inc., Kansas City, Mo.—Architects:** Engineering Dept., Sunshine Biscuits, Inc.  
**General Contractors:** Swenson Construction Co., Inc.  
**Electrical Contractors:** J. H. McKay Electric Co.

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and institutions  
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Time, in these four outstanding buildings—and hundreds more all over the country—is really up-to-the-second! Their time systems are IBM's newest. They're electronic!

Every wall clock, time recorder, and signal in these systems is always accurate, always uniform . . . automatically. Yet there is *no special clock or signal wiring*. IBM Electronic Time Systems\* are connected merely to regular AC lighting circuits. Installation savings are impressive.

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### Everyday Reference for practicing electricians

Each volume fully indexed; bold type subject headings throughout books; many tables, charts, schematic diagrams, photos, etc.—besides improving your electrical knowledge and skill, books condense many facts into small space, make them conveniently available whenever you have practical electrical problems to look up.

To do best work in electricity—to be able to solve a job problem when the regular method doesn't seem to work—requires knowing electricity from the ground up—requires knowing *why* as well as *how*.

And that's what this set of books gives you—an overall treatment of everything you need to know, from grounding in basic theory and fundamentals up to work in the relatively new field of industrial electronics.

- the principles of direct and alternating current are explained, with what they mean *practically* in the construction and operation of electrical circuits, devices, and machines made graphically clear
- you also are shown just the mathematics the electrician uses, in a well-illustrated treatment that takes you from the simplest formulas of wiring work up to the solution of complicated circuit problems
- how to wire for light and power is a basic job of the electrician that is fully covered. Included are farm, residential, and non-residential installations, with instructions for planning and doing the work, in both new and old buildings
- a generous part of the library is devoted to giving you practical knowledge of electrical machines—generators, motors, transformers, converters, controllers, etc.—with it is many facts you need to select, install, and operate them efficiently
- lastly the tubes, circuits, and generally split-second operations of electronic devices are made clear to you. Here is information the electrician, especially in industry, needs more and more today, and can quickly make use of, as it is presented in this library.

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## KNOW YOUR LABOR CURVES

[FROM PAGE 59]

started in a big way and all trades had their crews fully organized. Suddenly it was discovered that the column design had to be changed and the job progress virtually came to a halt. When the manpower demand curves for this project are plotted, they will show a rapid build-up, a short hump, and a sudden drop followed by a long flat section.

In good business practice, it is imperative that a contractor plot labor demand curves for some of his work. Not all jobs need such attention. However, in a widely varied selection of contracts, there are always many projects which should receive detailed analysis. There is no substitute for graphical representation when seeking a means of portraying certain specific details.

Plotting performance curves is nothing new. It has been considered an important part of good business practice for many years. Those electrical contractors who have been following this practice have found their efforts richly rewarded.

## MOTORIZED COPPER BAR BENDER

[FROM PAGE 51]

tuating rods are mounted over the "stop" button of each station. As the bending head reaches the 90-degree bend position, its arm engages the stop button lever. When the head is returned to open position, the other rod and stop button are actuated.

Bending short sections of bus bar is a one-man job with this equipment. The mechanic inserts and clamps the bus according to pre-established measurements. Then he inserts a shim between the bending block and the bus and pushes the start button on the "bending" station. When the 90-degree bend is completed, the hoist motor automatically stops. When the "start" button on the "return" station is pushed, the hoist motor reverses and pulls the bending arm back to original "open" position, stopping automatically when that point is reached. Once the bus bar is removed, the mechanic repeats the operation.

The shims placed between the bending block and the copper bar prevent marring the surface of the bus and permit using the same setting for bars of different thickness. On long sections of bus, another man is required to help position and support the copper bar.





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FREE BOOKLET Tells How to  
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One way is to feed more pig iron into  
the furnaces. But . . .

That will require *more* supplies of ore,  
limestone, coal, etc.\*—to say nothing  
of more new ore boats and rail cars to  
transport the additional supplies.

A better way—the *only* practical way  
—is to use the *dormant* iron and steel  
scrap lying around in the form of old  
machines, equipment, tools and metal  
structures.

Your business *must* have available  
scrap—in *some* form. That scrap is  
*needed* to keep the furnaces going in the

steel mills . . . to keep our fighting  
forces and our allies well armed . . . to  
sustain our civilian life at home.

Think how many ways *you* use iron  
and steel. Think what would happen if  
it became extremely scarce. Put your  
iron and steel scrap to good use—now  
—by selling it to your local scrap dealer.

Don't delay—the emergency is be-  
coming more severe every day.

\*For every ton of scrap fed into the furnaces,  
we save approximately 2 tons of iron ore,  
1 ton of coal, nearly ½ ton of limestone and  
many other critical materials. Also, scrap helps  
make steel faster, shortens the refining process.

NON-FERROUS SCRAP IS NEEDED, TOO!

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If it's *electrical*—make this your first source of information on “**Who**”, “**Which**” and “**Where**”—it will save your time. *Get the ELECTRICAL CATALOGS habit . . . today!*

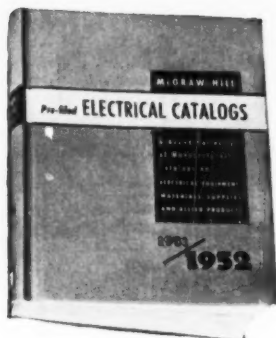
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NEW YORK 36, N. Y.**



## **SALES MANAGEMENT FOR AN ELECTRICAL CONTRACT BUSINESS**

[FROM PAGE 64]

1. Straight salary.
2. Expense account with a commission drawing account.
3. Straight commission with expenses allowed.

Sales incentives provide the greatest means of stimulating salesmen to maximum production, and it is generally recognized that salesmen perform best when compensated on some type of commission basis.

Strict, current accounting controls provide Sales Management with a constant guide as to the results which are being attained toward making sales quotas, and also assures the salesman himself of adequate compensation for his services.

The establishment of sales quotas is not purely an arbitrary matter. It is the determining factor as to how much business is required to sustain any operation on a profitable basis. It is the element which is largely a function of the amount of overhead costs which have to be covered by a certain volume of sales which are sold on a certain operating margin in order to show a profitable return to the business at the end of the fiscal business year.

From the foregoing discussion, it can be concluded that the basis of the operation of all departmentalized sales efforts is budgetary control over sales quotas accomplished through the combined efforts of Sales Management and the Accounting Department.

To summarize, Successful Sales Management can be attained in the electrical construction business if the following factors are observed:

1. All departments must be set up under individual departmentalized control.
2. Sales incentives must be established on intelligent sales quotas.
3. The Sales Manager must coordinate all of the tools of sales—namely, public relations, advertising, market research, and an established pricing policy in order to achieve these quotas.
4. Specialized sales personnel must be trained to properly handle the technical aspects of the electrical contracting business, and they in turn must be compensated on the proper basis.

A continuing reappraisal of the integration of these factors will stabilize business efficiency and assure its future development.

**40000 Foot  
Cable, Parkway  
Hazard—3 cond.  
#2 Standard,  
for 2300 V**

**CABLE—SWITCHES—LIGHT PLANTS  
FITTINGS—LINE POLE EQUIPMENT  
TRANSFORMERS—COMPLETE INVENTORY**

**220- 440- 2300-VOLT EQUIPMENT**

**CIRCUIT BREAKERS**

6 Breakers, Air Circuit, I.T.E. Circuit Breaker Co., Phila.—Type KB "Ureite", 600 amp., 480 v., 3 pole.

**ELECTRIC MOTORS**

- 1 Motor, Electric—Westinghouse 200 HP. Slip Ring Motor, Type CW8735—440 3 phase, 60 cycle—1175 RPM, S.B., splash proof, Style 1B6655, shaft extension both ends. Serial No. 1S1B6655.
- 1 Motor, Electric—Wagner Electric Corp. 150 H.P., Type RS1, Frame 35V, Model 1ESB227, RPM 575 440 volt, 3 ph., 60 cycle, 193 amp. Serial No. B7C341.
- 1 Motor, Electric, Wagner Electric Co., 150 H.P., Type RS1, Frame 35V, Model 1ES-B227, RI 575, 440 v., 3 ph., 60 cy., Serial Nos. C7C-1561.

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- 20 Transformers—Inductive Equipment Corp., 5 KVA, 3 ph., 2300/480/240 v., 60 cycle, dry type, Type FCT, spec. 1187MCI179, Serial Nos. 1317 to 1336, incl.
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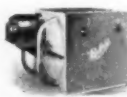


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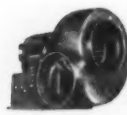
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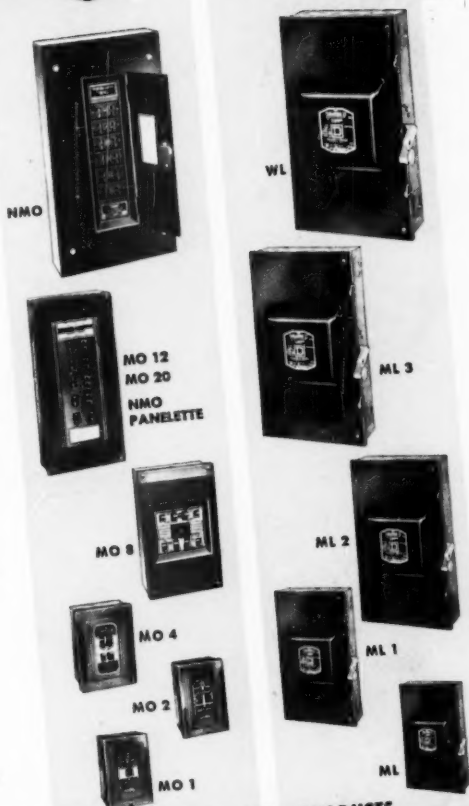
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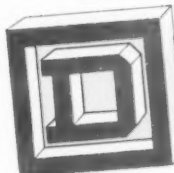
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